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Women's Empowerment and the Welfare of Children

Artemisa Flores-Martinez

A thesis submitted in fulfillment of the requirements for the degree of Doctor of Philosophy

University of Warwick

Department of Economics

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Contents

List of Tables

List of Figures

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Declaration

This thesis is submitted to the University of Warwick in accordance with the requirements of the degree of Doctor of Philosophy. I declare that any material contained in this thesis has not been submitted for a degree to any other university.

Artemisa Flores Martinez

6 December 2013

Abstract

This thesis investigates whether women's empowerment affects children's wellbeing in two developing countries: Mexico and India. The first chapter provides a background on women's empowerment. The second chapter evaluates a conditional cash transfer (CCT) program, which provides poor women in Mexico with tools to be better mothers, in terms of its impact on birthweight. The third chapter analyses whether empowered women, referred as those who have progressive gender attitudes, are more likely to have a firstborn girl in Delhi, India.

Specifically, the second chapter evaluates PROGRESA-Oportunidades, a program that pays mothers cash in exchange of their investment in their children's human capital: education, health, and nutrition. Using quantile regressions, the chapter finds a positive and significant program effect, but babies at the upper tail of the conditional birthweight distribution seem to have benefited the most. Moreover, maternal smoking during pregnancy is associated with a 459-gram decrease on birthweights at the 20th percentile of the conditional distribution, completely wiping out any program benefits. This effect is not picked up by least squares regression estimates, which is the technique used by previous literature on the subject.

The third chapter turns to India, a country that has lost millions of girls to sex-selective abortions. The chapter first constructs a women's empowerment (*progressivity*) index using a latent factor model, and then assesses whether progressive women are more likely to have a firstborn girl in Delhi. The latter territory has, unlike the Indian average, 'missing' women even among first order births. The results show that a one-standard deviation increase in the progressivity index is associated with a 5.8-percentage point increase in the likelihood of a firstborn girl relative to women who have not yet given birth.

1 Chapter 1: Introduction

The international community recognizes the lack of gender equality in the world and the need to achieve it in order for countries to prosper (World Bank (2007), World Economic Forum (2012)). The United Nations' Population Fund (UNFPA), for instance, states in its official website[1] that: "discrimination against women and girls -including gender-based violence, economic discrimination, reproductive health inequities, and harmful traditional practices - remains the most pervasive and persistent form of inequality"; and that "empowering women is an indispensable tool for advancing development and reducing poverty". Because of this, promoting gender equality and empowering women is one of the eight United Nations' Millennium Development Goals aimed at ending world poverty by 2015.[2]

1.1 Two notions of women's empowerment

Despite the term empowerment being widely used in the international development discourse, it still does not have a unique definition that everyone agrees with. In fact, it does not have a fixed translation in languages such as Spanish[3] and Italian for example. Furthermore, not everyone thinks that women's empowerment can be clearly defined; for many feminists, for instance, the value of the

[1] See http://www.unfpa.org/gender/ (accessed on the 19th of March 2013).

[2] The Millennium Development Goals were officially established in the United Nations Millennium Declaration in 2000 and consist of eight goals: eradicating extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality rates; improving maternal health; combating HIV/AIDS, malaria, and other diseases; ensuring environmental sustainability; and developing a global partnership for development. All United Nations member states and several international organizations agreed to meet these goals by 2015 (see http://www.un.org/millenniumgoals/bkgd.shtml).

[3] Some authors use the word "*potenciamiento*", others "*poderio*", and others the neologism "*empoderamiento*" (Stromquist (2002)).

concept lies precisely in its 'fuzziness' (Kabeer (1999)).

Initially, empowerment was most commonly associated with alternative development strategies involving local, community-based movements and their disenchantment with mainstream, state-led development practice. Specifically, social activists saw empowerment as a grassroots endeavour designed to inspire the poor and marginalized, including women, to challenge the status quo (Parpart et al. (2002)). Nonetheless, the idea of bringing women into the development process, and of focusing on their role in that process, emerged in the early 1970s in the USA with the *Women in Development* approach (Koczberski (1998), Adato et al. (2000)).

At that point, several (mainly female) development practitioners and researchers noticed that Third World women were ignored in the development efforts of major aid donors (e.g. the United Nations, the World Bank, the Food and Agriculture Organisation, the United States Agency for International Development (USAID), etc.), and that the economic situation of those women had barely improved over the years (Koczberski (1998)). Because of this, they began to push for greater representation of women in mainstream development agencies, and to demand that women be taken into account in those agencies' aid programs.

As a result, in 1972 the United Nations designated 1975 as the *International Women's Year*, highlighting the need to involve women in development practice (Koczberski (1998)). Likewise, the 1973 Percy Amendment to the US Foreign Assistance Act required the USAID to "give particular attention to those programs, projects and activities which tend to integrate women into the national economies of foreign countries."[4] Such "integration" however simply meant to incorporate women into the existing development practice under orthodox notions

[4]Quoted in Koczberski (1998, 396).

of development, as if that would automatically improve their lives (Koczberski (1998)).

The *Gender and Development* analysis that emerged in the late 1970s then focused on how the dynamics and structures of gender relations and gender inequalities affect women's health, sexuality, education, means of livelihood, and other aspects of their lives (Rowlands (1998)). The concept of women's empowerment then derives from the fact that power relations are embedded in relationships between men and women, in other social relationships in which women participate, and within institutions that affect women's lives (households, the state, labour markets, etc.) Empowering women thus implies a shift in those power relations in favour of women (Adato et al. (2000)).

The term empowerment itself was first used by Sen and Grown in *Development, Crises and Alternative Visions: Third World Women's Perspectives*, a publication that was widely distributed at the Third World Women's Conference in Nairobi in 1985, and which became a book in 1987. By the late 1980s, activists and theorists, had started to discuss the need of a new development approach that highlighted the role of culture and socio-economic inequalities in women's subordination (see, for instance, Sen and Grown (1988)[5], and Young (1993)), and saw the need of "women to become empowered so they can challenge patriarchal and political-economic inequalities" (Parpart et al. (2002, 10)).

As poverty moved up the scale of international priorities, and top-down, state led development practice continued to fail to alleviate it, the World Bank launched its *New Poverty Agenda* in 1990. The term "empowerment", and "participation" to secure it, entered the mainstream development discourse. Nonetheless, while empowerment is now often understood as a "process of transformation involving

[5]This book was first published by the Monthly Review Press in New York in 1987.

the acquisition of capabilities, as well as changes in subjectivity that enable agency to be exercised" (Molyneux (2006, 429))[6], major aid agencies tend to think of it only as a means to improve the productivity within the status quo, rather than to foster social transformation (Parpart et al. (2002)). Because of this, they usually emphasize only a reformative, rather than the transformative, nature of women's empowerment in their discourse.

Thus in general, there are now two notions of female empowerment, each of them involving different underlying capacities and freedoms for women. One of them is the "instrumentalist" notion, which emphasizes women's altruism and dedication to the collective family welfare, as well as their thrift, risk-aversion, industriousness and sense of civic responsibility (Kabeer (1999)). In this framework, empowering women may entail helping them to acquire abilities to benefit their families; women's empowerment is thus "instrumental" to achieve relatively altruistic purposes, and is therefore less likely to be resisted within the household.

An alternative notion of female empowerment is the selfish / self-interest one, which focuses much more on the conflictual element of gender relations. In this case, empowerment is put to the service of meeting women's own needs, and may thus attract greater resistance in society. Empowering women may thus involve making them more conscious of their duties to themselves, and of their own physical, emotional, and mental welfare. In this context, what is valued as evidence of altruism (women's tendency to put the needs of others in the family before their own) in the first model, is interpreted in this model as evidence of women's internalization of their own subordinate status (Kabeer (1999)).

As the instrumentalist notion of women's empowerment builds on claimed synergies between feminist goals and official development priorities (e.g. lower

[6]Note however that this is not the only definition of empowerment available in the literature, and other definitions will be given in this thesis later on.

fertility, infant mortality, and malnutrition, etc.), it is the one that has received more attention in the discourse and practice of mainstream development agencies. In contrast, advocacy for feminist goals in intrinsic terms has not been as successful, perhaps in part because it would require policy makers to reflect about power relations, and the social injustice that is inherent to the prevailing economic system. In any case, the popularity of women's "empowerment" as a goal in the development agenda of major aid donors, and the latter's concern with cost-benefit analyses, has required its quantification (Kabeer (1999)).

Clearly, what indicators are used to measure empowerment depends on the precise concept that the researcher has in mind. Indeed, some authors argue that *instrumental* empowerment does not really represent empowerment. In this context, the notion of power is crucial. Kabeer (1999), for instance, suggests that a way to think of it is in terms of the ability to make choices; to be disempowered thus means to be denied choice. Empowerment is then defined as a process of change by which those who have been denied the ability to make strategic life choices (e.g. whether or not, and who, to marry, whether to have children, etc.) acquire such ability.

Likewise, Basu and Koolwal (2005) contend that the extent to which women control their own bodies and health may be a better indicator of empowerment than any measures of female altruism. Indeed, they argue, some examples of conditioning and pressure leading to desirable (maternal) behaviour cannot automatically be labelled as empowerment or exercise of free choice. Because of this, Kabeer (1999) suggests accounting for structural parameters in the analysis of individual choice by qualifying the latter in terms of the conditions in which it takes place, its contents, and its consequences. Similarly, Fierlbeck (1997) asserts that women would be much more likely to expand their ability to make choices

if they were to view themselves as individuals rather than members of a social group. Lastly, Jackson (1996, 497) shares that "it may well be true that women prioritize children's needs, but there is a sense in which one might wish them to be a little less selfless and self-sacrificing".

The divide between instrumental versus selfish empowerment can further be seen in the empirical literature by noting that studies differ in whether they use female empowerment as a dependent, or as an independent variable; and if the latter, in the sort of, or whose, outcome(s) they analyse. That is, if one thinks of women's empowerment as an 'instrument' then, almost by definition, one will use it as an independent variable; as an instrument for something else, the latter being one's real concern (e.g. fertility rates, child mortality and malnutrition, etc.) Alternatively, if one is more interested on the selfish notion of empowerment, then one could, for instance, use an indicator of whether or not a woman chose her spouse, and use it as a dependent / independent variable.

Needless to say, if empowerment is used as an independent variable, the strength and sign of the association between it and the outcome under investigation will depend on what the latter is, as well as on how exactly empowerment is being operationalized. The dependent variable could, for instance, be either a measure of children's wellbeing, or of women's own welfare outcomes (e.g. their health, nutrition, share of household work and resources like food, leisure, etc.) On the other hand, empowerment could be measured using altruistic and/or 'selfish' behaviours on the part of women. These decisions will influence the correlation between female "empowerment" and a given achievement. Indeed, Basu and Koolwal (2005) show that there may be potential trade-offs between women's own health versus child health, resulting from the presence of the two different notions of female empowerment.

This thesis explores the impact of women's empowerment on the welfare of children. In particular, the second chapter relates to the *instrumentalist* notion of empowerment, and the third chapter to the *selfish* one. More specifically, the second chapter evaluates the Mexican conditional cash transfer program *PROGRESA-Oportunidades*[7] in terms of its impact on the birthweight of babies born into enrolled households. The program claims to empower women (Adato et al. (2000)) by paying cash to mothers in exchange of them investing in their children's human capital: education, health, and nutrition.

Moreover, the mother of the family herself must obtain preventive healthcare twice a year, and attend talks on health, hygiene and nutrition every two months. Pregnant beneficiaries must also attend a number of antenatal care visits and are, along with breastfeeding women, entitled to receive nutritional supplements (SEDESOL (2009)). Using quantile regressions, the second chapter finds a positive and significant program effect at various points of the birthweight distribution. There is thus evidence that the program successfully "empowers" women by giving them resources to become better mothers and benefit their children, such that the latter are born with higher weight.

The third chapter turns to India, a country where the persistence of gender inequality manifests itself in its millions of 'missing' women. The term, coined by Amartya Sen (1990), refers to the fact that millions of women are lost every year to sex-selective abortions and excess mortality relative to males. Because of this, sex ratios are unnaturally male biased in countries like India. In this context, the third chapter first estimates an index of the *selfish* notion of women's empowerment, referred as *progressivity*, including, among others, indicators of whether or not

[7]PROGRESA is an acronym for *Programa de Educacion, Salud y Alimentacion* (Education, Health and Nutrition Program); the program's name changed to *Oportunidades* (Opportunities) in 2002. Each of those names on their own, or "*PROGRESA-Oportunidades*" will be used interchangeably throughout this thesis.

women control their own bodies and access to healthcare for themselves. The chapter then explores the effect of *progressivity* on the sex of the first child, and on the duration to first birth in Delhi. The focus on this territory is due to the fact that, unlike the national average, it has a deficit of girls already among first order births.

The results show that a one-standard deviation increase in the *progressivity*/empowerment index is associated with a 5.8 percentage point increase in the likelihood of a firstborn girl, compared to women who have not yet given birth. Additionally, more progressive women do not experience longer first birth intervals which, together with the first result, is consistent with those women being less inclined to sex-select their first child.

Lastly, the chapter estimates the firstborn's sex equation for two other Indian states: Kerala and Punjab, and finds no effect of individual empowerment. This result is understandable in the case of Kerala as that state has a balanced child sex ratio. On the other hand, the result for Punjab highlights the importance of the gender context, which may serve to negate the effect of individual-level empowerment on well-being achievements.

This thesis contributes to the literature on women's empowerment by providing empirical examples of how the two types of empowerment, instrumental and selfish, can affect children's welfare. Moreover, the third chapter analyses women's empowerment as a dependent variable first, and then as an independent variable. In the latter case it also analyses two demographic outcomes. The first one is child-based, the firstborn's gender; and the second one is mother-based: the duration to first birth. Furthermore, the child outcome also affects women's health, as it is the product of a pregnancy, and it may have major implications for the mother, and for society as a whole, if that baby happened to be the firstborn

due to previous abortion(s).

Given this interplay between child's, mother's, and society's welfare, the third chapter introduces a new term to the literature: *progressivity*. *Progressivity* can be seen as closely related to the selfish notion of female empowerment as it highlights only conflictual elements of gender relations. Nevertheless, it crucially differs in that it stands on purely humanist grounds. That is, it is based exclusively on perceptions and behaviours of women that could be defended from a human rights perspective, even though they are likely to be contested within the household. The need for introducing the new term is also due to the existent conceptual debates regarding what constitutes empowerment and what does not; the difference between women's "empowerment" and "autonomy"; and the debate on whether "full" autonomy/empowerment is really beneficial for women and thus, whether it should be sought/supported. These issues are discussed in Subsection 1.3.3.

In sum, this thesis contributes to the female empowerment literature by drawing attention to the fact that, although interventions that aim at empowering women in an "instrumental" way can bring about benefits for children, they may leave the unequal gender context unchallenged or even reinforce it, such that women's own individual welfare might be decreased. Additionally, this thesis provides a case study that illustrates how women's (em)power(ment) can contribute to lessen prevailing gender inequalities; but at the same time, it highlights the relevance of the gender context in enhancing or negating the effect of individual-level empowerment on well-being outcomes that impact humanity as a whole.

1.2 *PROGRESA-Oportunidades* and *instrumental* empowerment

1.2.1 The anti-poverty program

As the World Bank (2007, 10) asserts, studies from around the world show that: "the greater the mothers' control over resources, the more resources households allocate to children's health, nutrition, and education." Moreover, "better maternal education also benefits children through improved hygiene practices, better nutrition, lower fertility rates, and hence higher per child expenditures". All this together contributes to "future growth and poverty reduction". It is under this instrumentalist logic that the conditional cash transfer program *PROGRESA-Oportunidades* was introduced in Mexico in 1997. The program is targeted at those living in extreme poverty and first began operating in rural communities; it has gradually expanded to urban areas such that it currently serves 20 percent of all households in Mexico (5.8 million families). *Oportunidades* is thus the main government anti-poverty program in Mexico, both in terms of budget and coverage.[8]

PROGRESA is one of the *New Anti-poverty Programs* that have been introduced in Latin America in the last decades, and that see "integrating women" as a way to secure broader development objectives (Molyneux (2006)). Those programs are part of the *New Social Policy* approach that originated in the 1990s as state-led development approaches continued to fail to alleviate poverty. At that

[8]The program's budget suggested by the president in Mexico (i.e., it still has to be approved by congress) for the fiscal year 2014 (1 January - 31 December) is around 5859 million USD, including evaluations and operation costs (http://www.24-horas.mx/presta-bid-a-mexico-10-del-presupuesto-de-oportunidades/). Mexico's Central Bank's (www.banxico.org.mx) official average exchange rate for the period January-August 2013 (12.66 Mexican pesos per USD) was used to obtain the figure in USD.

point, the state was accused of nurturing a culture of welfare dependency and thus, of being a major cause of the development failure. In order to increase efficiency and cost-sharing, international development agencies like the World Bank thus started to formulate and support social policies in which beneficiaries bear some of the costs of development. Cost recovery, co-financing, co-management schemes, and programs entailing some sort of community work became popular tools to promote self-help in development projects (Molyneux (2006)).

Oportunidades designates the mother of the family as the beneficiary on behalf of her household. This is in contrast to previous anti-poverty programs in Mexico and implies that the cash transfers, and the main responsibilities associated with them, are given directly to mothers. The program's designers justify this feature alluding to a growing literature (e.g. Thomas (1990), Haddad (1999)) showing that resources controlled by women are more likely to translate into greater improvements in child health and nutrition than resources controlled by men (Adato et al. (2000)). Gomez de Leon and Parker (2000) explain that this may be due to women being more responsible with money and more concerned with the welfare of their children, such that they spend more on their family.

Additionally, program staff argues that *PROGRESA* empowers women by increasing their control over resources and thus their bargaining power (Adato et al. (2000)). A program policy document, for instance, reads:

> "*PROGRESA* seeks to improve the condition of women and empower the decisive role they play in family and community development. The aim in this regard is to satisfy their healthcare and nutritional needs, while providing them with information and skills to promote their advancement."[9]

The program works as follows. The mother of the family receives a cash transfer every two months conditional on her household fulfilling certain duties.

[9] Quoted in Adato et al. (2000, 46).

The grant consists of two components. First, scholarships are paid for each child in school between grades 3-12[10] (usually ages 8 to 18); children must have a minimum of 85 percent attendance at school, and should not repeat a grade more than twice. The stipend increases as children progress in school and starting from grade 7[11] is 10 percent higher for girls than for boys (see Table 1.1). There is however an upper limit for the scholarship component of the transfer (SEDESOL (2013)).[12]

The second component is a fixed (i.e., independent of the household's demographic composition and place of residence) amount[13] that is intended to buy food, and that is conditional on family members obtaining preventive healthcare. This means adults attending biannual health check-ups, and talks on health, hygiene and nutrition once a year; the latter increases to six times per year in the case of the mother of the family. Beneficiary women must also take their children for health check-ups at: 7, 28, and 60 days after birth; once per month for ages 2 months-2 years; once every 4 months for ages 2-4 years; and once every 6 months

[10]In 1997, compulsory education in Mexico used to start at grade 1 of primary school, when children are normally 6 years old. At that time, the scholarship used to be offered only between grades 3-9. In 2001 however, it was expanded to include the three upper high school grades (10-12). Furthermore, it is also currently available for children enrolled in school grades 1 and 2 residing in localities with less than 2500 inhabitants (SEDESOL (2013)).

[11]That is, at the onset of middle education, when females generally start dropping out of school (Molyneux (2006)).

[12]For the second semester of 2012, such cap was set at about 97 USD per month for families with children enrolled in primary and lower secondary school; and at 178 USD for families with children enrolled in upper secondary school (SEDESOL (2013)). Mexico's Central Bank's official average exchange rate for that period (13.06 pesos per dollar) was used to obtain the figures in US dollars (see http://www.banxico.org.mx/SieInternet/)

[13]This amount was set at about 34 USD for the second semester of 2012 (see SEDESOL (2013) and http://www.banxico.org.mx/ for the exchange rate). Given this minimum amount of the transfer and the cap set for the scholarships, the program's subsidy could represent between 29 and 178 (18 and 114) percent of the minimum income necessary for a single person residing in a rural (urban) area not to be labelled officially as "poor" in Mexico in December 2012. Official poverty statistics, including monthly per capita poverty lines, in the country are provided by Mexico's National Council for the Evaluation of Social Development Policy (CONEVAL) (see http://www.coneval.gob.mx/Medicion/Paginas/Lineas-de-bienestar-y-canasta-basica.aspx). The official average exchange rate for December 2012 (12.87 pesos per dollar) was used to obtain the figures in US dollars (see http://www.banxico.org.mx/).

for ages 5-18 years. Likewise, pregnant women in beneficiary households must attend at least five health check-ups, and lactating women two (see Table 1.2). The latter two groups of women, along with under 2-year-olds and malnourished children younger than 5 years, are also provided with nutritional supplements (SEDESOL (2009)).

Additionally, the mother of the family must attend monthly meetings with *promoters*[14] where program information is conveyed, and undertake 29 hours of unpaid communal work per month. The latter is organised by doctors, nurses and/or program promoters, and typically involves cleaning and painting schools and health facilities, and clearing rubbish (Molyneux (2006)). Failure to comply with any of the program duties can lead to having the household's registration as a beneficiary cancelled (SEDESOL (2009)).

1.2.2 Program evaluation

The selection of beneficiaries into the program in rural areas consists of three steps: 1) identifying the poorest localities in Mexico; 2) selecting the eligible (poorest) households in those localities; and 3) having a community assembly approve the list of beneficiaries (INSP (2006)).

Due to logistical and financial constraints *PROGRESA-Oportunidades* has been introduced in phases. At the program's inception, the Mexican govern-

[14]Promoters are beneficiary women who volunteer and are (officially) elected by other beneficiaries to serve as a liaison between the latter and *PROGRESA* officials. They receive training and meet with beneficiaries at least once per month to talk about the program. They are thus "elected" community voluntary workers who take on leadership roles. Note however that in some localities beneficiaries have denounced the fact that promoters have in reality not been elected by them but by the national incumbent political party, PRI (Institutional Revolutionary Party), of which promoters happen to be members (Red Nacional de Promotoras y Asesoras Rurales (2000)).

ment capitalized on these constraints and randomly selected 506 poor localities in seven Mexican states (Guerrero, Michoacan, Hidalgo, Puebla, Queretaro, San Luis Potosi and Veracruz)[15] to participate in an *evaluation sample*. Out of them, 320, the "early intervention group", were randomly selected to start receiving benefits from May 1998 and the rest, the "original control" or "delayed intervention" group, started to enrol in September 1999, and to receive benefits soon thereafter.

The program's quantitative evaluation then consisted of periodically interviewing all households in the 506 localities between November 1997 and November 1999, and then again in the autumn 2003 (see Table 1.3). As by then all 506 localities had been incorporated into the program, a "new control group" was created by matching each of the original localities to a locality that had not yet enrolled using propensity score matching (Todd (2004)).

PROGRESA-Oportunidades has been widely evaluated. In fact, the Mexican government commissioned an independent organization, the International Food Policy Research Institute (IFPRI), headquartered in Washington D.C., to undertake the "official" program evaluation. Quantitative studies, which for the most part use the quasi-experimental data described above, have generally found that the program does improve outcomes related to the three human capital components (education, health and nutrition) that it seeks to better. Nevertheless, an extra 0.6 million Mexicans were living in poverty in 2012 compared to 12 years earlier[16] (two years after program benefits started to be distributed), which casts doubts about the program's success as an anti-poverty strategy.

[15] During the first phase of operation, the program was running in the following eight states (out of a total of 31 states plus Mexico City which, administratively, is a (the) "federal district"): Campeche, Coahuila, Guanajuato, Hidalgo, Puebla, Querétaro, San Luis Potosí, and Veracruz.

[16] This information was taken from the official webpage (http://www.coneval.gob.mx) of Mexico's National Council for the Evaluation of Social Development Policy (Consejo Nacional de Evaluacion de la Politica de Desarrollo Social (CONEVAL)), which is the institution in charge of providing official poverty statistics in the country.

Because of this, it is important to note three things. First, data from the *evaluation sample*, coming from a handful of Mexican states, are not representative of the whole population under *PROGRESA*.[17] Second, even if extrapolation of results was possible, what we learn from them are only marginal effects, such that the level of the variable that is being analysed may still be too low even after treatment under the program. That is, beneficiaries might, for instance, not live in "extreme poverty" anymore, but still be poor[18] or, beneficiary children might be taller than similar non-*PROGRESA* children, but still be stunted. Third, several studies report a lack of transparency in the selection of beneficiaries, such that families that deserved to be included in the program because they were poor enough are not, and some which should not be included are (Red Nacional de Promotoras y Asesoras Rurales (2000); Pastrana 2005)).[19]

More critical evaluations have thus resulted from studies that do not use the

[17]For instance, three states with large proportions of people living in poverty, as well as indigenous people, Yucatan, Oaxaca and Chiapas, are not included in the *evaluation sample*. This is very relevant as it is precisely in rural areas in those states, plus Guerrero, where qualitative evaluations find malnutrition prevalence to be unacceptable high (Pastrana (2005)).

[18]In Mexico, official poverty statistics are provided by the National Council for the Evaluation of Social Development Policy (Consejo Nacional de Evaluacion de la Politica de Desarrollo Social (CONEVAL)) based on data from the Socioeconomic Characteristics Section (Modulo de Condiciones Socioeconomicas (MIC)) of the National Survey on Households Income and Expenses (Encuesta Nacional de Ingreso-Gasto en los Hogares (ENIGH)). The latter is gathered by the National Institute of Statistics, Geography and Informatics (Instituto Nacional de Estadística, Geografía e Informática (INEGI)). The CONEVAL defines *poverty* as living on an income below the *welfare line*, and with at least one of six basic social deprivations (CONEVAL (2013)). The *welfare line* equals the cost of a per capita *basic basket of goods*, which is updated by the CONEVAL every month, and that includes the (per capita) *basic food basket*. In July 2013, the former was set at 188 (120) USD for urban (rural) residents (http://www.coneval.gob.mx). On the other hand, the six basic social deprivations are (lack of): food security; access to health services; education (access and years completed); housing (accounting for both size and quality); access to basic services in the dwelling (water, electricity, and sewerage); and access to social security. A person living in *extreme poverty* is in turn defined as one living on an income below the *minimum welfare line*, which equals the cost of the *basic food basket*, and with at least three social depravations (CONEVAL (2013)). In July 2013, such line was set at 91 (65) USD in cities (the countryside), respectively (see http://www.coneval.gob.mx).

[19]This has unintentionally disrupted the social fabric in some localities by creating social tensions (Pastrana (2005)). As for the presence of "not poor enough" beneficiary families in the *evaluation sample*, studies, including the second chapter in this thesis, generally exclude those observations from their analyses.

evaluation sample to assess the program. Those studies are often qualitative in nature and analyse information obtained through interviews with (focus) groups of beneficiaries, non-beneficiaries, promoters, doctors, etc. in *PROGRESA* localities. Likewise, other analysts evaluate *Oportunidades* by looking at aggregated outcomes (i.e. for the whole population), either within localities under the program[20] or for the whole country.[21] Given that *Oportunidades* is the most expensive anti-poverty program in Mexico's history, such assessments are relevant.

This section presents an overview of the main findings regarding the three human capital components that *PROGRESA* seeks to improve, as well as those involving more aggregated outcomes such as poverty and migration. Subsection 1.2.4.2 in turn reviews the link between *Oportunidades* and women's status / empowerment. Both sections include, whenever possible, evaluations of the type described in the previous paragraph. Note however that the literature review in this chapter is not exhaustive as *Oportunidades* has been, and continues to be, widely evaluated.

1.2.2.1 Nutrition

In terms of nutrition, the program has been found to be associated with an increase in total food consumption (Ruiz-Arranz et al. (2006)); caloric acquisition (Hoddinott and Skoufias (2004), Ruiz-Arranz et al. (2006)); diversity of food

[20] An example of this kind of evaluations is the one undertaken by the National Institute of Public Health (Instituto Nacional de Salud Pública (INSP)) and the Centre for Research and Higher Studies in Social Anthropology (Centro de Investigación y Estudios Superiores en Antropología Social (CIESAS)) in 2004, henceforth "INSP-CIESAS evaluation", which is well referred in Pastrana (2005).

[21] That is, instead of estimating marginal effects by comparing control and treatment groups, these studies look at the proportion of people (not only children) who are still living in poverty, extreme poverty, malnourished, illiterate, etc.

consumption (Ruiz-Arranz et al. (2006)); and dietary quality (Hoddinott and Skoufias (2004)).

Specifically, Hoddinott and Skoufias (2004) construct a variable measuring caloric availability in the household based on food consumption data. They find that beneficiary households experienced a median increase in caloric acquisition of 6.4 percent after having been 18 months under the program. The increase came mainly from calories from vegetable and animal products, such that dietary quality improved.

On the other hand, Ruiz-Arranz et al. (2006) evaluate the impact of *PROGRESA* and *PROCAMPO* -another CCT program in Mexico that depends on agricultural production, on food consumption (expenditures), caloric availability, food diversity, agricultural home production, and food purchases paid in cash. They find that both programs boost total food consumption and caloric intake in similar proportions. Specifically, food purchases increase by 31 (33) cents for every Mexican peso received under *PROGRESA* (*PROCAMPO*). Nonetheless, in the case of *PROGRESA*, increased food security is achieved through market purchases, whilst under *PROCAMPO* it is attained through investment in agricultural home production. *PROGRESA* thus increases diversity in food consumption and the degree of access to retail food markets.

The above studies use mean estimates to reach their conclusions. Nevertheless, using simulations, Djebbari and Smith (2008) find evidence of substantial variation in program impacts on per capita consumption (measured as the sum of both food and non-food expenditures). After examining several plausible assumptions, they find that only a small fraction of individuals may experience a fall in consumption as a result of *PROGRESA*.

Similarly, Chavez-Martin del Campo (2006) uses bootstrap simulations to find

that the impact of *PROGRESA* on both total expenditure and food purchases exhibits a lot of heterogeneity. Specifically, assuming rank preservation, the program effects are found to be positive within the treated population, but larger for better-off households. This result, referred as "distributionally regressive" in the paper, is consistent with Djebbari and Smith (2008) who, under the same assumption, find that those with the highest consumption levels in the absence of *PROGRESA* experience the largest program effects. Intuitively, this result makes sense given that the conditioned-on good, human capital, is a normal good. These studies thus draw attention to the importance of exploring the impact of *PROGRESA* beyond simple mean effects.

1.2.2.2 Health

Oportunidades has also been found to be associated with better child health outcomes. This includes lower morbidity rates (Gertler (2004)); higher rates of growth (see, for instance, Gertler (2004), Habicht et al. (2004), Behrman and Hoddinott (2005), Leroy et al. (2008), Fernald et al. (2008), and Fernald et al. (2009)); lower risk / prevalence of stunting (see, for instance, Behrman and Hoddinott (2005) and Fernald et al. (2008)); lower risk / rates of anemia (e.g. Gertler (2004), Habicht et al. (2004)); lower body mass index and overweight prevalence (Fernald et al. (2008)); higher birthweight (Barber and Gertler (2008, 2010)); better development (e.g. cognitive, motor and language skills) (Fernald et al. (2008)); and improvements in children's behaviour (see, for instance, Ozer et al. (2009) and Fernald et al. (2009)).

The program's impact on adult's health has also been explored. However, in that case some of the results depend on the subsample that is being analysed.

Fernald et al. (2008a), for instance, find *PROGRESA* to be associated with lower body mass index, obesity prevalence, blood pressure, and prevalence of uncontrolled hypertension among adults aged 30-65 years. In contrast, Fernald et al. (2008b) find that the opposite occurs among adults aged 18-65 years. Likewise, Urquieta et al. (2009) find that *Oportunidades* is positively associated with increased skilled attendance at delivery only among a subsample of women.

1.2.2.2.1 Children's health

This subsection details the results regarding child health outcomes. Gertler (2004) finds *PROGRESA* to be associated with lower morbidity among children aged 1-6 months born into beneficiary families, and among those in families who have been under the program for two years, and who were 2-37 months old at the program's onset. Additionally, children who had been under the program for one year were 25.5 percent less likely to be anaemic, and grew about one centimetre more than similar non-*PROGRESA* children. No significant program effect was found on the probability of being stunted.

Habicht et al. (2004) in turn find that age- and length-adjusted height was 1.1 cm greater among children who were younger than 6 months at the program's onset, lived in the poorest households, and had been under the program for 14-17 months (depending on when exactly their household was interviewed). Moreover, the paper also finds that after one year of program exposure, the mean haemoglobin value (age-adjusted rate of anaemia) was higher (lower) among children in the early intervention group, than in the delayed intervention group; those differences had disappeared after two years, when both groups had been under the program for at least one year.

Likewise, Behrman and Hoddinott (2005) find that children who did receive the *PROGRESA* nutritional supplements,[22] and who were 12-36 months old at the program's onset experienced a one sixth-increase in mean growth (height-for-age z-scores) per year, and a lower probability of stunting after 14-17 months under the program. That height increase corresponds to about one centimetre, and the effect is slightly larger for children from poorer households and poorer communities, but whose household head is more educated than average. Lastly, the paper estimates that the increase in adult height alone could result in a 2.9-percent increase in lifetime earnings.

On the other hand, Leroy et al. (2008) find that, after two years of program exposure, urban children who were younger than 6 months at the program's onset grew 1.5 cm more, and gained an additional 0.76 kg, than similar non-*PROGRESA* children. Importantly, the effect on height was larger among children in the poorest intervention households. No program effect was found on older children (6-24 months old at baseline).

Fernald et al. (2008) in turn analyse several health and development outcomes among children aged 24-68 months who were born into and raised by beneficiary households. They find that a doubling of cash transfers[23] is associated with improved growth (height-for-age z-score); as well as lower prevalence of stunting, body-mass index for age percentile, and overweight prevalence; and better motor,

[22] This detail is crucial as often there were children who were meant to receive the supplement but for some reason did not receive it. Reasons for this may be that the health clinic ran out of supplements, or that there was no one at the clinic to provide them. Other issues not considered in the paper but that have been pointed out by qualitative evaluations are that often, even if the mother receives the supplement for her child, the family is so poor that the supplement is shared by the whole family; alternatively, the family may have some animals, and thus uses the supplement to feed them in order for them to grow bigger and be sold at higher prices ((Pastrana (2005)).

[23] This means comparing two beneficiary households which differ in that by 2003 one of them had received a total amount of cash that was twice what the other one had received, either because the former enrolled earlier in the program, or due to its demographic composition.

cognitive, and language development.

Likewise, Ozer et al. (2009) investigate the prevalence of (mother-reported) behavioural problems among 4-6-year-olds after 4-5.5 years of program exposure. They find *Oportunidades* to be associated with a 10 percent decrease in aggressive/oppositional symptoms, but no effect on anxiety/depressive symptoms nor on total behavioural problems. There was also no differential effect by gender or ethnicity (indigenous / non-indigenous).

Similarly, Fernald et al. (2009) find that an additional 1.5 year of program exposure (i.e. early versus delayed treatment) is associated with reduced behavioural problems (measured using an adapted version of the Strengths and Difficulties Questionnaire) among 8-10 year-olds who had been under the program for 8-9.5 years. No differential effect was found on children's height- nor body mass index-for-age z-scores, nor on cognitive and language development. However, 18 months of additional program exposure before the age of 3 was associated with a 1.5-cm growth (height-for-age z-score) increase for children whose mothers had no education.

Barhan (2013) in turn uses municipality-level data to show that *PROGRESA* has led to a 17-percent decline in infant mortality among beneficiary children in rural areas. No program effect was found on neonatal mortality.

Lastly, Barber and Gertler (2008, 2010) investigate the impact of *Oportunidades* on mean birthweight. They find that babies born into households that had already received their first cash transfer are on average 127.3 grams heavier. Nevertheless, it may be particularly important to explore the possibility of heterogeneous program effects in this case as previous literature has shown that being born with low weight (less than 2.5 kilograms) can negatively affect a child's development and probability of survival (see, for instance, Boardman et al. (2002),

Behrman and Rosenzweig (2004), Friede et al. (1987), McCormick, (1985), McIntire et al. (1999)). Learning whether children at the bottom of the birthweight distribution have benefited from *Oportunidades* is thus very relevant.

Chapter 2 in this thesis evaluates the impact of *PROGRESA-Oportunidades* on the whole birthweight distribution. Using quantile regressions, the paper finds that the program has had a positive effect on birthweight, but babies at the upper tail of the conditional birthweight distribution appear to have benefited the most. Specifically, the program impact varies from 135 grams on birthweights at the 20th percentile of the conditional distribution to 207 grams on birthweights at the 80th percentile.

Furthermore, the paper uncovers the large deleterious effect of maternal smoking on lower quantiles. In particular, smoking decreases birthweights at the 20th percentile of the conditional distribution by 460 grams, completely wiping out any program benefits. This effect is not picked up by least squares regression estimates.

It is however important to mention that previous evaluations have reported that weight readings for under-five year-olds are sometimes inaccurate because of two main reasons. First, children are weighted with clothes; and second, health personnel do not usually calibrate the scales as they ignore how to do it (Pastrana (2005)). This may explain why the INSP-CIESAS evaluation finds that a large number of nutritional disorders among *PROGRESA* children remain undiagnosed.

Specifically, that evaluation cross-checked around 15,000 observations from the two main public health providers in Mexico: the Health Ministry (SS) and the Mexican Social Security Institute (IMSS). They found that 40 (30) percent of under-five year-olds registered as having normal weight in SS (IMSS) clinics were actually undernourished; and 29 (21) percent of them were overweight. Moreover,

among those who were registered as undernourished, 30-60 percent (depending on their malnutrition level) were not given adequate treatment. The latter percentages were similar for both health providers (Pastrana (2005)).

Importantly, whilst most of the children found to be malnourished were living in rural areas, the majority of overweight children were urban residents. Assuming that this tendency will continue, researchers at the National Institute of Public Health (INSP) estimate that the incidence of malnutrition in the countryside (especially in states like Guerrero, Oaxaca, Chiapas and Yucatan) would reach acceptable levels only by 2050, and in indigenous communities by 2080 (Pastrana (2005)), even in the presence of *Oportunidades*.

1.2.2.2.2 Adults' health

Regarding adults' health outcomes, Fernald et al. (2008a) analyse a sample of 30-65 year-olds who had been exposed to *Oportunidades* for 4-5.5 years. They find that body mass index, obesity prevalence, blood pressure, and prevalence of uncontrolled hypertension were all slightly, though not significantly, lower among adults from intervention communities, compared to those in control localities. Likewise, the former reported better fitness outcomes (e.g. being able to exert some physical effort without suffering fatigue) than the latter.

In contrast, Fernald et al. (2008b), using the doubling of cash transfers comparison that has already been described, find that the program actually worsened most of the above outcomes (body mass index, grade I and II obesity, overweight prevalence, and diastolic blood pressure) among 18-65 year-olds after the same length (4-5.5 years) of program participation. These results are very relevant as Mexico has recently been recognized as being the "world's fattest nation", with

32.8 percent of its population classed as obese.[24]

On the other hand, Andalon (2009) finds no effect of *Oportunidades* on smoking among adults after an average of four years under the program. The paper does not find an income effect on adult male smoking either. In contrast, it concludes that *PROGRESA* might have increased slightly the smoking rates of adolescents in treated households.

Urquieta et al. (2009) in turn explore the effect of *Oportunidades* on the probability of obtaining skilled attendance at delivery during the first 14 months of the program being offered. They find that women who had a birth short before the program's inception, and the next one under treatment were 11.4 percentage points more likely to obtain skilled attendance while delivering the latter child. However, no program effect, or even a negative one, is found when the whole sample is taken into account.

Ozer et al. (2011) find *Oportunidades* to be associated with lower levels of self-reported symptoms of depression (including lower frequency of stressful situations and higher perceived sense of control during the previous week(s)) among rural women after 4-5.5 years of program exposure. In particular, *Oportunidades* was associated with a 1.7-point decrease in the Center for Epidemiologic Studies' Depression Scale (whose range is 0-60), compared to women in the control group. The authors thus conclude that reducing poverty can have positive indirect effects on women's mental well-being.

Lastly, Barham and Rowberry (forthcoming) show that in the short-run (1-2.5 years of treatment), *PROGRESA* is associated with a 4 percent decline in average senior (aged 65 and older) mortality due to diabetes and infectious diseases.

[24] See http://www.huffingtonpost.co.uk/2013/07/10/obesity-mexico-united-states-fattest-country_n_3571988.html

1.2.2.3 Education

As scholarships are a basic component of *Oportunidades*, the latter's effect on educational outcomes has been widely studied. In a nutshell, the program has been found to be associated with higher school attendance (see, for instance, Buddelmeyer and Skoufias (2003) and Cattaneo and Lalive (2009)); increased time devoted to homework (Behrman et al. (2012)); higher enrolment rates (Behrman et al. (2000), Schultz (2004), Behrman et al. (2005), Todd and Wolpin (2006) and (2008), Dubois et al. ((2012), Attanasio et al. (2010), and Behrman et al. (2012)); lower dropout rates and school re-entry (e.g. Behrman et al. (2005) and De Janvry et al. (2006)); better school performance, i.e. less grade repetition (Behrman et al. (2005)), and higher probability of passing grades (Dubois et al. (2012); and higher educational attainment (Schultz (2004), Cho (2005), Behrman et al. (2005) and Bando et al. (2005)).

More specifically, Attanasio et al. (2010) show that *PROGRESA* is associated with higher school enrolment rates, especially among children above primary school; Todd and Wolpin (2006) find such an association for children in each age group, and Dubois et al. ((2012) for children at each school grade. Schultz (2004) in turn divides the analysis by school grade and gender, and finds a positive program effect for both genders, with the impact being often larger for girls than for boys. In contrast, Behrman et al. (2005) unveils a program effect only for children older than 11 years, with the largest impact being for those enrolled in grades where the subsidies are the greatest. The latter finding is consistent with Schultz (2004).

Additionally, Schultz (2004) and Behrman et al. (2005) estimate that the accumulated effect of increased schooling from grades 1-9 implies an average in-

crease in educational attainment of 0.66-0.68 years,[25] which in turn would imply an 8 percent increase per year in real terms in the beneficiaries' future wages (Schultz (2004)). On the other hand, Cho (2005) finds that the program effect on educational attainment is greater for children in larger families, as well as for older female children. Finally, Bando et al. (2005) show that, while prior to the program indigenous children had a lower average school attainment than similar Spanish-speaking / bilingual children, that gap has been reduced after treatment under *PROGRESA*.[26]

Oportunidades has also been found to be associated with lower dropout rates among children aged 11-14 years (especially among those transiting from primary to secondary school), and with school re-entry among dropouts (Behrman et al. (2005)). Moreover, De Javry et al. (2006) show that *PROGRESA* largely decreases, or even completely counteracts, the negative effects of shocks (e.g. unemployment or illness of the household head, or severe natural disasters) on school participation. Likewise, Cattaneo and Lalive (2009) show that the program increases school attendance among eligible children, and that non-eligible (not poor enough) children acquire more schooling when the subsidy is introduced in their village. Behrman et al. (2005) however do not find such evidence of spillover effects.

As for school performance, Behrman et al. (2005) uncover a negative association between *Oportunidades* and grade repetition among 6-10 year olds. Likewise, Dubois et al. (2012) show that the program positively affects the likelihood of passing grades for primary school children.

[25] This would represent a 10-percent increase in mean educational attainment among 18 year olds, who currently have only 6.8 years of schooling on average.

[26] As an aside, note that the authors also find that while children in indigenous households had a greater probability of working before the onset of *Oportunidades* compared to Spanish-speaking / bilingual children, this probability is reversed after treatment.

Children in beneficiary households who were themselves too young (0-8 years old) to be eligible for direct scholarship support at the program's inception (1997) also seem to have benefited from *PROGRESA*. In particular, Behrman et al. (2009) show that a 4-5.5-year household-level program participation is associated with: reductions in the school-starting age among children who were 1-2 years old in 1997; increases in grades of completed schooling and progressing on time among children who were 3-5 years in 1997; and increases in schooling grades among children who were 6-8 years pre-program.

Finally, Behrman et al. (2012) show that *Oportunidades* has also been successful in cities, where families had to register their interest in the program, and then be deemed to be eligible. In this context, the paper finds that program treatment increases school enrolment, educational attainment, and time devoted to homework in the short-run (1-2 years of exposure).

Nevertheless, it is important to mention that some qualitative evaluations have stressed the fact that often, although beneficiary children officially attend school and pass school grades, they in fact do not. Teachers however agree to tick their attendance and pass them in exchange of a bribe, which families can now afford to pay with their *PROGRESA* money (Pastrana (2005)).

1.2.2.4 Other program impacts

Being *PROGRESA-Oportunidades* an anti-poverty program, it is crucial to evaluate whether it has helped to reduce poverty. In this sense, such an effect has indeed been found (see, for instance, Bando et al (2006) and Skoufias and di Maro (2008)), especially among indigenous people (Cardenas-Rodriguez et al. (2004)). Moreover, using simulations, Davis et al. (2004) show that the program would

allow households to cope during severe macroeconomic crises, like the one Mexico experienced in 1995; and that it would help to reduce the post-crisis rural poverty gap. This result is consistent with Skoufias (2007) who finds *PROGRESA* to be associated with a reduction in the vulnerability of households' consumption to income fluctuations.

Likewise, Gertler et al. (2012) show that *Oportunidades* is associated with increases in productive investments in microenterprises, animals, and land, all of which increase households' income generation ability. The latter in turn is found to be associated with a 34-percent increase in households' consumption after 5.5 years under the program. Moreover, Angelucci and de Giorgi (2009) contend that ineligible households in treated villages also benefit from the program, as they too increase their consumption. In particular, they receive gifts and loans from eligible households, or benefit by reducing their savings.

Despite these findings, note that while the percentage of people living in poverty and extreme poverty in Mexico may have decreased since the launch of *PROGRESA*, the number of people living in those conditions may have actually increased. That is, while 24.1 percent of the population lived under the *minimum welfare line*[27] in 2000, only 20 percent of the population were in that condition in 2012. This is equivalent to 23.7 and 23.5 million people, respectively. Likewise, the figures regarding "poverty" were 53.6 and 45.5 percent in 2000 and 2012 respectively.[28] This means 52.7 and 53.3 million people respectively. Furthermore, the United Nations' Economic Commission for Latin America and the Caribbean

[27]This means living on a per capita income, at the household level, lower than the required amount to acquire the (per capita) basic food basket (CONEVAL (2013)).

[28]Note that these figures are not quite comparable as the definition and measurement of "poverty" changed in 2010. In 2000, there were three different types of "poverty". The one that is the most similar to the current poverty definition, which is given in footnote 18, is the "assets poverty". The latter was defined as living on a per capita income, at the household level, lower than the necessary amount to cover one's basic food, health, education, clothes, shoes, housing and public transportation costs (see www.coneval.gob.mx).

(ECLAC) has recently found that the only Latin American country, among those for which data is available, where poverty increased in the last year was Mexico. Specifically, according to the Commission's estimates, the percentage of people living in poverty, as a percentage of the total population in Mexico, increased from 36.3 in 2010, to 37.1 percent in 2012 (ECLAC (2013)).[29]

Even if we disregarded the ECLAC's estimates, as well as the number of people living in (extreme) poverty according to the CONEVAL, and concentrated only in the percentages provided by the latter, there are still, in my view, two serious problems with *Oportunidades*. First, the reductions in poverty might not be self-sustainable. That is, given that poverty definitions relate, in a nutshell,[30] to whether or not one has an income high enough to cover one's basic needs such as food, education, health, housing, etc., and that *Oportunidades* provides funds to cover some of those needs then, by definition, the number of people living in (extreme) poverty should decrease, as long as the program targets the poor.

The question however is whether people who under the program are not "extremely poor" anymore, but just "poor", or who are not poor at all anymore, would remain above the (*minimum*) *welfare line*, if the program was cancelled. Given that the program does not generate employment opportunities for school-leavers, and even less for their parents, and that Mexico's economy has had a very mediocre growth for three decades now, the most likely answer is no; beneficiaries

[29]Moreover, the same percentage was "only" 31.7 in 2006. Similarly, 8.7, 13.3, and 14.2 percent of the total population in Mexico was living in a condition of extreme poverty or indigence in 2006, 2010, and 2012, respectively. All figures are based on data from household surveys conducted in the respective countries. Similar to the CONEVAL's methodology, the ECLAC measures poverty as a synthetic multidimensional index that includes income measures as well as a set of indicators of unmet basic needs. The latter include water and sanitation (lack of access to improved water sources and lack of a toilet facility); energy (lack of electricity and using a cooking fuel that is hazardous to health); dwelling (including makeshift housing materials and crowding); and education (including non-attendance at school and non-achievement of a minimum level of education) (ECLAC (2013)).

[30]For a detailed description of how poverty is officially defined and measured in Mexico, please refer to footnote 18.

would go back to their (extreme) poverty condition overnight.

The second problem is equally serious, if not more. Note that, given that the economy has not been growing much for decades, a large proportion of the *Oportunidades* budget has come from international loans. Therefore, not only the apparent[31] improvements might not be permanent, but Mexico is accumulating a large amount of debt[32] in order to obtain them. Furthermore, those debt contracts are such that the loans have to be repaid in a single payment, in 2025 and 2027 for instance. If the country does not have the necessary money to finance the program now, it is not clear whether it will have it then, unless it starts having a more sustained and higher growth rate.

In any case, the fact is that malnutrition coexists with obesity in Mexico, that both are rampant,[33] and that 53.3 million Mexicans live in poverty. The latter will be impossible to eradicate unless its structural causes are attacked. A more sustainable way to fight poverty might thus be to promote and support

[31]Apparent because it has already been pointed out, for instance, that beneficiary children are probably not even attending school and acquiring knowledge, and that young children may not even be properly weighted (see Pastrana (2005)).

[32]Specifically, the program's annual budget for the fiscal year (1 January-31 December) 2009 and 2010 was around 1812 and 3076 million USD, respectively (using the official average exchange rate for each of those years (13.5 and 12.63 pesos per USD respectively) provided by Mexico's Central Bank (www.banxico.org.mx)), including external evaluations and operation costs (http://sipse.com/archivo/aumentan-presupuestos-a-seguro-popular-y-oportunidades-11549.html). Likewise, the program's budget suggested by the Mexican president for the fiscal year 2014 (i.e., it still has to be approved by congress) is approximately 5859 million USD. The Mexican government received a 1503.75 million USD loan from the World Bank in 2009 (http://*Oportunidades*.mx/Portal/wb/Web/), and a 1250 million USD one in 2010 (http://www.proceso.com.mx/?p=99345) to finance *Oportunidades*. Furthermore, a 600 million USD loan has already been agreed with the Inter-American Development Bank for the fiscal year 2014 (http://www.24-horas.mx/presta-bid-a-mexico-10-del-presupuesto-de-oportunidades/). All three loans have to be repaid in a single payment in 2025, 2027, and 2025, respectively. In between, a variable (Libor-based) interest rate is payable. These are only some of the loans that have been received from international organizations throughout the years to fund *Oportunidades*.

[33]According to the INSP-CIESAS evaluation, 66 percent of the rural population is malnourished (Pastrana (2005)). At the same time, in July 2013 Mexico was found to be the country where the largest proportion of the total population is classified as obese (http://www.huffingtonpost.co.uk/2013/07/10/obesity-mexico-united-states-fattest-country_n_3571988.html)

productive projects among poor people, to provide them with loans, training and, crucially, to improve rural infrastructure. Road construction, for instance, may have more development spillover effects than transferring small amounts of cash to poor people. Roads would reduce transportation costs and thus help farmers to distribute and commercialize their products cheaper and easier. That would increase their incomes and strengthen their productive units. They themselves would then decide, and be able, to keep their children in school and provide them with more nutritious food.

Finally, this subsection will review the literature on the impact of *PROGRESA* on migration flows. Angelucci (2004) and Rubalcava and Teruel (2006) find a positive program effect on international migration (to the USA). This is consistent with theoretical predictions as the program helps to reduce household credit constraints. Nonetheless, Davis et al. (2005) find the opposite effect in the short-run. Both results may coexist. That is, the program may decrease migration in the short-run -while adolescents receive their scholarships-, and increase it in the long-run -when the subsidy stops after high-school-, if former beneficiaries cannot find jobs in Mexico.

The latter is very likely, as qualitative evaluations point out. For instance, a report by the Red Nacional de Promotoras y Asesoras Rurales (2000)[34] finds that around 85 percent of young beneficiaries were unable to find work in their communities. This result is consistent with Pastrana (2005) and Molyneux (2006). Moreover, the latter study highlights that beneficiaries had the intention of migrating to the USA after concluding their studies. The author thus points out that "without attention to rural livelihoods, *Oportunidades* risks educating the young for the US labour market" (Molyneux (2006, 444)). Lastly, the program effect on

[34]This report was based on a survey of 309 beneficiaries and 60 interviews with promoters, teachers and health professionals in eight *PROGRESA* localities.

internal migration has been found to be positive by Rubalcava and Teruel (2006), but non-existent according to Angelucci (2004) and Davis et al. (2005).

1.2.3 Women's status, autonomy and empowerment

1.2.3.1 Conceptual framework for empirical purposes

As it was pointed out in the introduction, there is not a unique definition of empowerment that everyone agrees with. Kabeer (1999) however provides a conceptual framework that is useful when trying to measure empowerment. In her view, empowerment involves three dimensions: resources (pre-conditions), agency (process) and achievements (outcomes), that jointly determine the meaning of an indicator and thus its validity as a proxy for empowerment. In particular, resources serve to enhance the ability to exercise choice, and include access and future claims to material, human, and social resources. Agency in turn is the ability to define one's goals and act upon them even against the opposition of others; it thus includes decision making, negotiation, manipulation, resistance, reflection, and analysis.

This framework highlights that access to resources does not automatically translate into women's empowerment; that is, into changes in the choices that women are able to make. Likewise, better outcomes for women may not necessarily be the result of women's increased empowerment / agency. Thus for instance, *PROGRESA* increases women's access to (monetary) resources, but this may not necessarily translate into women deciding how to spend that money. Furthermore, in case we do observe better outcomes for women as a result of the program (e.g. improved mothers' health, or an increase in the purchase of ladies clothing), could

this unambiguously be interpreted as evidence of women's empowerment, i.e. as the result of women's agency? Not necessarily as increased access to resources may not translate into women deciding and acting more freely because they may face opposition from their husbands. In that case, the former may choose to negotiate with the latter, or even give up the full grant to them.

It is thus crucial to learn whose agency was involved in translating resources (the cash transfers) into impact. Otherwise, better women's outcomes may represent, for instance, women's increased purchasing power, and/or their greater role in decision-making about the distribution of household resources, and/or the greater weight given by household heads (husbands) to women's well-being in recognition of the latter's role in bringing in economic resources. On the other hand, even if increased access to resources translated into greater women's ability to make choices, the latter may not necessarily mean an overall improvement in women's well-being (e.g. their health, the relationship with their spouses, etc.) The next sections will review the empirical literature dealing with these issues.

Adato et al. (2000) provide another useful framework while trying to measure empowerment. In particular, they break down empowerment into three different types, each of them having several underlying characteristics. These are:

- Personal empowerment: self-confidence, self-esteem, sense of agency, sense of 'self' in a wider context, and dignity.
- Empowerment in close relationships: ability to communicate, negotiate, obtain support, defend self/own rights, and a sense of 'self' in the relationship.
- Collective empowerment: group identity, collective sense of agency, group dignity, self-organization and management, and dignity.

On the other hand, it is important to mention that some researchers have drawn distinctions between women's empowerment and female autonomy. Dixon-Mueller (1998, 3), for instance, defines autonomy as an "individual's capacity to act independently of the authority of others", and female empowerment as the "capacity of individual women or of women as a group to resist the arbitrary imposition of controls on their behaviour or the denial of their rights, to challenge the power of others if it is deemed illegitimate, and to resolve a situation in their favour." Other authors use the word "process" to differentiate between the two concepts. Basu and Koolwal (2005, 16), for instance, assert that empowerment is "a process through which women become able to resist contrary pressures and take charge of their own lives". Given these definitions, the empowered woman is presumably the autonomous woman, and indeed, both concepts are usually operationalized in the literature using the same indicators. Several studies thus use both terms interchangeably (e.g. Jejeebhoy (2000), Kishor (2005), Basu and Koolwal (2005)). In this context, this chapter will include both, studies referring to women's "autonomy" as well as those measuring women's "empowerment" while reviewing the empirical literature.

Additionally, Chapter 3 in this thesis introduces the notion of *progressivity*, which is defined as "favouring the advancement of society towards improved conditions".[35] Since we are talking about women, this concept may be rephrased as "favouring the advancement of women towards improved conditions in society". Furthermore, given that empirically *progressivity* highlights only conflictual elements of gender relations (see Subsection 1.3.3.2.1), it may be seen as closely related to the selfish notion of women's empowerment.

[35]Given the dictionary definition of the adjective progressive (http://www.wordsense.eu/progressive/), this would be the definition of the respective noun *progressivity*.

Nevertheless, *progressivity* crucially differs in that it stands on purely humanist grounds. That is, it is based exclusively on attitudes and behaviours of women that could be defended from a pure human rights perspective, even though they are likely to be contested within the household. Like this, the words "*progressivity*" / "progressiveness" emphasize the progressive, forward, as opposed to backward or retrograde, nature of certain beliefs and attitudes towards gender roles. Subsection 1.3.3.2.1 provides a rationale for the introduction of this new concept.

Likewise, note that there is a lack of consensus regarding whether women's education should be blindly equated to women's empowerment. On the one hand, in a context of low female school enrolment rates in developing countries, empowerment has often been used to mean mere participation in the formal system. Duflo (2012, 1053), for instance, defines empowerment as "improving the ability of women to access the constituents of development -in particular health, education, earning opportunities, rights, and political participation".

Nonetheless, Stromquist (2002, 24) argues against such approach as it "assumes that the experience and knowledge attained in schooling automatically prepare girls to assess their worth and envisage new possibilities", while in reality, it may prepare them to accept established traditional gender roles. It is thus not evident that schooling raises consciousness about the need to challenge asymmetrical gendered power which, in Stromquist's (2002) view, is more important for determining women's agency, than the simple ability to code and decode print. Therefore, whether or not education is empowering depends on the objectives particular educational programs seek, the forms they take, and the instructional modes they use. This debate is further reviewed in Subsection 1.3.3.2.1.1.

In any case, note that most empirical studies on women's empowerment include education as a socio-economic characteristic rather than as a "direct" indicator of

empowerment. Because of this, education is not included in women's empowerment/autonomy indeces. Instead, it might be seen as a determinant of "direct" measures of empowerment (either indeces or individual indicators) and so, be included in a table or equation showing correlations between those empowerment "setting" variables (women's education, employment, co-residence with in-laws, age at marriage, etc.) and "direct" measures of empowerment (e.g. Jejeebhoy (2000), Frankenberg and Thomas (2001), Matthews et al. (2005), and Alfano et al. (2011)).[36]

Alternatively, when no such correlation is shown firstly, education is then simply used as an additional covariate in the main equation. It is then referred in the text as an indicator of women's (socio-economic) "status" (e.g. Kishor and Nietzel (1996) and Sathar and Kazi (2000)); as an "enabling" factor / "indirect" / "proxy" measure of empowerment (e.g. Kishor (2000)); or as a simple socio-demographic characteristic (e.g. Hindin (2005)).

1.2.3.2 Measurements

Studies differ in the dimensions (resources, agency and achievements) of empowerment which they focus on. Access to economic resources, as well as inheritance and property rights for women, may potentially be used as indicators of the resource dimension of empowerment. However, as the *PROGRESA* example in the previous subsection shows, "access" indicators simple point out to potential options available to women rather than to *actual* choice and so, they might

[36]Subsection 1.3.2 details the variables that Matthews et al. (2005) and Alfano et al (2011) use as "direct" measures of empowerment. On the other hand, Jejeebhoy's (2000), Frankenberg and Thomas' (2001), and Kishor and Gupta's (2009) empowerment indicators focus mainly on women's participation in intra-household decision-making such as expenditures in food, children's education, seeking healthcare for children, etc.

not be meaningful measures of empowerment. Because of this, it is important to relate any potential indicator to all three empowerment dimensions in order to determine whether it is in fact a meaningful empowerment indicator (Kabeer (1999)).

Consider, for instance, the following reality in India, where the law was changed after independence to give Hindu men and women equal inheritance rights. Despite this legal change, Agarwal (1994) and Das Gupta (1987) account for the difficulties (involving even been murdered) that women in the state of Punjab face whenever they ask the law, rather than customary practices, to be applied. The legal change thus failed to change traditions and customary law, such that increased access to resources did not translate into changes in individual agency and choice.

Because of this, researchers generally introduce some aspect of agency into empowerment indicators. Specifically, the concept of "control" has been widely used. Kishor (2000, 124), for instance, defines empowerment as "women's increased control over their own lives, bodies, and environment"; and identifies women's "ability to access information, take decisions, and act in their own interests, or the interests of those who depend on them" as essential aspects of empowerment (Kishor (2000, 119)). Like this, contrary to Basu and Koolwal's (2005) findings, Kishor (2000) is, by definition, denying the possibility that there might be trade-offs between women's self-interest and their children's, and that empowerment may affect those interests differently depending on how exactly it is measured.

As Kabeer (1999) notes, "control" thus turns out to be as elusive to define and measure as "empowerment". For instance, in the literature "control" has been used to mean "having a say" in relation to a resource (e.g. household budget); "choice" (e.g. choosing own spouse); self-reliance (e.g. women's ability to support

themselves without their husbands' help); and decision-making ("having the final say") on various issues, which go from everyday decisions (e.g. purchase of food), to once in a lifetime choices (e.g. selecting a marriage partner).

Other authors have structured empowerment / autonomy indicators into different spheres / domains as follows.

- **Economic security:** whether women: can support themselves without their husbands' help (Kishor (2000)); make economic contributions to the household; control their own income; and have assets / savings to use under their own name and control (Alfano et al. (2011)).

- **Decision-making:** whether women have a say on:

  Household decisions:

  - Household budget (Kishor (2000)) / expenses / purchases (e.g. Cleland et al. (1994), Sathar and Kazi (2000), Kritz et al. (2000)); and how to spend husband's income (Kritz et al. (2000))
  - Food purchased (Razavi (1994), Morgan and Niraula (1995), Sathar and Kazi (2000)) / cooked (Kishor (2000))
  - Purchase of clothes, jewellery and gifts for wife's relatives (Sathar and Kazi (2000))
  - Purchase of small items of jewellery (Jejeebhoy (2000))
  - Purchase of major household goods (e.g. Jejeebhoy (2000), Becker (1997), Sathar and Kazi (2000), Hashemi et al. (1996))
  - Sale and purchase of assets (e.g. land) (Razavi (1994) and Kritz et al. (2000)); purchase of major assets (Hashemi et al. (1996)); major

market transactions (Morgan and Niraula (1995)); inputs, labour and sale in agricultural production and other income-generating activities (Razavi (1994)); and sale and purchase of livestock (Sathar and Kazi (2000))

- Visits to friends and relatives (e.g. Cleland et al. (1994), Kishor (2000))
- Children's health: seeking healthcare for sick children (e.g. Razavi (1994), Jejeebhoy (2000), Kritz et al. (2000), Kishor (2000))
- Children's rearing (Kritz et al. (2000))
- Children's education (whether or not to enrol them, type of school, and how much education) (e.g. Razavi (1994), Cleland et al. (1994), Kishor (2000), Kritz et al (1997), Sathar and Kazi (2000), Jejeebhoy (2000))
- Children's marriage (e.g. Sathar and Kazi (2000), Kritz et al. (2000))

Strategic life choices:

- Number of children to have (e.g. Morgan and Niraula (1995), Becker (1997), Sathar and Kazi (2000), Kritz et al. (2000))
- Use of family planning methods (e.g. Kishor (2000), Kritz et al. (2000))
- Wife working outside home (e.g. Morgan and Niraula (1995), Kritz et al (1997), Becker (1997), Sathar and Kazi (2000))

- **Mobility in the public domain:** whether women can go alone to: the market; the field; the next village; the health centre; and to visit relatives (e.g. Kishor (2000), Alfano et al. (2011)).

- **Participation in the public domain:** participation in public action; participation in organizations; speaking out in meetings; political and legal awareness.
- **Beliefs and perceptions:** belief in daughters' education; perceptions of own capabilities; beliefs in women's independence and rights; beliefs in equal access to food, education, healthcare, and decision-making for women.
- **Domestic violence:** incidence of male violence (e.g. Jejeebhoy (2000), Sathar and Kazi (2000)); fear from husband (Sathar and Kazi (2000)).

Answers to these questions are usually either given equal weights and combined into a single index (i.e. ranging from 0 to 5 if there are 5 measurements within a given sphere), or entered separately as dummy variables in a regression.

1.2.4 Does *PROGRESA* empower women?

1.2.4.1 Potential impact

Oportunidades centres on the development needs of children -both born and unborn, but crucially depends upon women performing their traditional social role as caregivers for its success. Women are entitled to receive cash benefits, but in return must ensure their children's regular attendance at school, regularly take them for health check-ups, attend monthly meetings with promoters and bimonthly health talks, and undertake unpaid work (SEDESOL (1999)). The program thus effectively makes cash transfers conditional on 'good motherhood', where the latter cannot include women missing a clinic appointment or a workshop

because they were at work (Bradshaw and Quirós Víquez (2008)). *PROGRESA* readily assumes that any actions that improve children's well-being are not a 'burden' for women, and that any 'costs' that the latter bear are part of the mothering role (Bradshaw and Quirós Víquez (2008)).

Indeed, women in beneficiary households must be self-sacrificing mothers; attending to the own needs of those women is not *PROGRESA*'s main goal. This is a clear example of the instrumentalist version of empowerment: women's altruism is put at the service of their children's needs. Still, as Adato et al. (2000) suggest, *Oportunidades* might "empower" women by:

- Giving them cash. This may increase women's intra-household bargaining power, their decision-making autonomy regarding household expenditure, and enhance their status in their communities.
- Directing the benefits toward expenditures that normally fall within women's decision-making domains (e.g. food). This may increase the number of decisions that women make within the food / cooking sphere, but it might also expand the decision-making domains in which women participate.
- Educating women about health, nutrition, hygiene, and family planning.
- Giving girls higher school bursaries compared to boys. This should encourage girls and parents to support female education and thus, increase girls' chances of a better position in the future (in the household, labour market, etc.)

Additionally, *PROGRESA* may empower women in other indirect ways. For instance:

- Increasing women's mobility. That is, by giving women opportunities to leave their houses, and sometimes their communities, without their husbands in order to fulfil their program obligations.

- Providing opportunities for women to communicate with each other and talk about their concerns. Although it is not officially encouraged by the program, this might occur, for instance, during the health talks, the meetings with promoters, the community work, etc.

- Changes in the community gender context. Gender attitudes might change when the government chooses to hand in money directly to mothers -rather than fathers, and when girls' education is emphasized.

- Enabling women to develop confidence with speaking out in groups. This might be especially true in the case of promoters who have to speak out during their monthly meetings with beneficiaries.

On the other hand however, given the new attention and time demands that *PROGRESA* puts on women, the program may also unintentionally increase social tensions within households (Adato et al. (2000)).

1.2.4.2 Actual impact

1.2.4.2.1 Impact on girls

By providing higher grants for girls since the onset of secondary education (grade 7, usually 12 years of age), *PROGRESA* may have a differential effect on girls' schooling compared to boys'. As Subsection 1.2.2.3 has made clear, this

in fact seems to be the case. In particular, Schultz (2004) estimates that the accumulated effect of increased schooling from grades 1-9 would imply a 0.72-year increase on the average educational attainment of girls, compared to a 0.64-year increase on boys'. Likewise, Behrman et al. (2000) estimate that the program is positively associated with increased enrolment rates among 12-14 year-olds in the short-run (between the years 1997-1999), and that the respective estimates for females are larger than those for males.

Given the positive effect of *Oportunidades* on schooling described in Subsection 1.2.2.3, one may expect to see a negative program impact on overall child labour. In this respect, Parker and Skoufias (2000) do find such evidence, both on paid and unpaid work. Nevertheless, the authors also find that a substantial number of beneficiary children continue to combine work and school.

In particular, girls' reductions in work are less than their increase in school enrolment, which implies that their leisure time is reduced under *PROGRESA*. This is consistent with other paper's findings. Specifically, although no significant reduction in adults' labour market participation rates (see also Bando et al (2006) and Skoufias and di Maro (2008)) nor in their leisure time (see also Skoufias and di Maro (2008)) is found, there is evidence that satisfying program obligations has put a burden on women's time resources, and that the latter's participation in domestic chores has been slightly reduced under the program.

More recently, Behrman et al. (2011) find that an additional 1.5 years (i.e. 5.5 versus 4 years) of program exposure is associated with an average increase in schooling grades completed among children aged 9-15 years at the program's onset (1997), of about 2.4 percent for boys, and 2.7 percent for girls. Likewise, greater program exposure decreases the proportion of boys working by 4.1 percent, but there is no significant effect for girls.

The paper also compares children who have been under the program for 5.5 years to similar children with no program exposure. The results show that boys aged 9-12 years pre-program (1997) accumulate 0.9-1 additional grades of schooling. Older children (13-15 years old in 1997) accumulate 0.5. Nevertheless, although the respective effect on girls aged 9-12 years pre-program is also positive, it is smaller, being 0.7-0.8, and there is no effect for older girls.

Additionally, the authors find that young boys' (aged 9-10 years in 1997) wage labour force participation rate decreases by 30 percent as a result of the program. There is no overall impact for older boys (aged 13-15 pre-program), but there are important reductions in agricultural work, implying some substitution from agricultural to non-agricultural work.

In contrast, there is no effect on young girls' (9-12 year old pre-program) wage labour participation, but *Oportunidades* is associated with a 20 percent increase in older girls' (13-15 years old in 1997) employment, for which there was no program impact on schooling. It might thus be that these girls are substituting in the labor market for their younger male siblings, who do experience increases in their schooling as well as work reductions (Behrman et al. (2011)). The authors present evidence that that increase may come from non-agricultural labour. Lastly, regarding *PROGRESA*'s impact in urban settings in the short-run (1-2 years), Behrman et al. (2012) find a negative program effect only on boys' working rates.

1.2.4.2.2 Impact on mothers

1.2.4.2.2.1 Positive impacts

Adato et al. (2000) analyse patters of intra-household decision making and control of resources based on interviews with focus groups of beneficiaries, non-

beneficiaries, and promoters in *PROGRESA* localities. Specifically, they investigate the probability that the husband (wife) decides on his (her) own, relative to the probability that the decision is made jointly by both spouses, regarding eight different issues. These are: how to spend women's *PROGRESA* income; household expenditures (on food, child clothing, durables, and house repairs); and children's health / education (taking the children for medical attention, telling them to go to school, and giving them permission to leave the house).

They find that the only domain in which women, both beneficiaries and non-beneficiaries, report to make decisions on their own is on food purchases. Nevertheless, cash transfers slightly decrease the probability of husbands being the sole decision maker in five areas: children's medical attention, school attendance and clothing, food expenditures, and major house repairs. These changes are largely consistent with *PROGRESA*'s focus on children's healthcare, nutrition, and education. Furthermore, treatment under *PROGRESA* increases the probability that a woman decides on her own on the use of her extra income, relative to deciding jointly with her husband. No spillover effects were found on the decision making patterns of non-beneficiaries.

Likewise, Lechene and Attanasio (2002) reject the unitary model of intra-household distribution of resources among *PROGRESA* families. In particular, the paper concludes that a wife's relative income share is a positive and significant determinant of her decision making power in her household.

On the other hand, Rivera et al. (2006) find that overall domestic violence (i.e. including any type of) is 1.9-5.9 percentage points less prevalent among women residing in cities and who have been enrolled in *Oportunidades* for about 3 years, depending on the control group used (eligible for benefits but not enrolled, or not eligible). The same is true for psychological violence. Likewise, physical, sexual,

and economic violence is less prevalent among beneficiaries compared to similar non-eligible women. Nonetheless, the authors highlight the need to investigate who these women are. That is, to find out how they have managed to fulfil the cost-sharing responsibilities that the program demands from them for already three years.

Maldonado et al. (2006) in turn interview focus groups of husbands in beneficiary households, and find that in all cases violent husbands rose up in a home where domestic violence was prevalent. In their current home, tense situations appear mainly due to money, sickness, sexuality, religion and decision making. In general, husbands do not report money from *PROGRESA* as an issue trilling violence, as they understand that that money is given to their wives explicitly to "fulfil their maternal duties towards their children". Therefore, they think that it is appropriate that mothers receive and manage that money. Furthermore, they admitted their appreciation for the program as the latter relieves them from some of the pressure they feel for ensuring their families well-being.

Similarly, Angelucci (2008) finds that *PROGRESA-Oportunidades* decreases husbands' alcohol abuse by 15 percent, and that small transfers decrease husband violence by 37 percent for all households. However, large transfers increase the aggressive behaviour of husbands with traditional views of gender roles, perhaps because they see their identity threatened. In the latter case, the evidence is inconsistent with the standard unitary, collective, and bargaining models of intra-household allocation.

On the other hand, Molyneux (2006) finds evidence that the program has had some impacts on personal empowerment. In particular, women felt that their self-esteem was enhanced as a result of the stipends, and some even felt that they acquired more status in their neighbourhoods, with shopkeepers treating them

as creditworthy. Moreover, women felt that, by giving the resources to them, and choosing them to take on *PROGRESA*'s responsibilities rather than men, the government recognizes their importance to the family's welfare, and their higher level of responsibility with money and towards the family compared to men (Adato et al. (2000)).

Lastly, some promoters mentioned that participating in the collective program activities generated elements of personal empowerment in them. Specifically, they recognized having gained increased freedom of movement, more confidence speaking out in groups, awareness of their situation as women, increased knowledge as a result of the health talks and in general, "opening their minds."[37] They also described increased opportunities to talk to other women about their concerns, and to find common experiences (Adato et al. (2000)).

1.2.4.2.2.2 Negative impacts

Participation in *PROGRESA* places extra time demands on women and increases their workload. Women's duties include: travelling and waiting to receive their grants; attending monthly meetings with promoters; attending health talks; taking their children to schools and health clinics; attending their own healthcare appointments; undertaking community work; and doing household work that was previously done by some of the children who are now attending school (Adato et al. (2000)).

In this context, some women report having experienced problems with their husbands due to the time they spend out of the house to fulfill their program responsibilities. Women thus try to minimize conflict by being certain to do their housework (cleaning, cooking, and attending upon their children and husbands),

[37] Quoted in Adato et al. (2000, 7).

as well as their work outside home (e.g. helping their husbands in the family's agricultural plot), before leaving the house. This increases their time burdens, but it is the price they are willing to pay to maintain intra-household harmony (Adato et al. (2000)).

Similarly, Espinosa (2006) uses data from *Oportunidades* and focus groups interviews and finds that most beneficiaries combine their usual domestic chores with multiple economic activities. She then highlights the precariousness in which these women's work takes place, and the fact that their labour market participation rate remains constant across age groups. The latter is in contrast to what happens among the general population, where women's participation in the labour force decreases during the childbearing period.

The author thus denounces that the fact that the program assigns the cost-sharing responsibilities to women risks to introduce, leave unchallenged, and even reinforce the restrictive interpretation of women's social role as mere and sole caregivers, and their lower position in gender hierarchies. Additionally, Molyneux (2006) notes that *Oportunidades*' cost-sharing responsibilities may have large opportunity costs by preventing women from engaging in paid work.

Furthermore, in some communities, women and doctors denounced that men take women's *PROGRESA* money. This is very relevant as it would influence the type of goods that are purchased with that money, and for whom they are. It also has implications for household power relations and the extent to which the program is, or is not, changing them (Adato et al. (2000)).

On the other hand, some women reported that they are exercising broader decision-making authority as a result of *PROGRESA*, and that they are experiencing a sense of new empowerment by no longer having to ask their husbands for money each time they need to buy something. Nevertheless, these women also

noted that if they now buy, for instance, shoes for the children, whereas previously they used to receive money from their husbands to that end, husbands now give them less money than they used to. This situation has implications for women's net benefit from the program (Adato et al. (2000)).

Finally, note that there is no evidence that *PROGRESA* has brought about a change in attitudes and beliefs towards gender roles. For instance, although women strongly support their daughters' education, when they are asked to compare the importance of girls' education to that of boys', they, as well as fathers, tend to favour boys'; the reasons being "men's responsibility as breadwinners and as head of their households", and the fact that "girls get married",[38] and become housewives. Indeed, as long as the socioeconomic environment does not change and opportunities for using secondary education in the wage labour market are scarce or not existent, attitudes about the value of girls' education may remain low.

1.2.5 Critical appraisal

1.2.5.1 Overall program

Despite the program being internationally perceived as very successful, it has also been severely criticized. On the one hand, some of the studies that use the *evaluation sample* to assess the program have suggested changes in the transfers' schedule and / or in the targeting to increase efficiency.

For instance, Todd and Wolpin (2006) recommend eliminating the scholarship for grades 3 to 5 and increasing it for grades 6 to 9 by about 50 percent. Such

[38] Both phrases are quoted in Adato et al. (2000, 97).

a change, they argue, would induce a greater impact (of about 0.1 years) on average school attainment at a similar cost to *PROGRESA*. Likewise, Attanasio et al. (2005) suggest eliminating the grant for primary education (grades 3-6), and increasing it for lower secondary education (grades 7-9). They contend that such modification would allow the program to have substantially larger effects on enrolment for the latter, while having minor effects for the former and being revenue neutral for the government.

Similarly, De Janvry and Sadoulet (2006) advice to eliminate school bursaries for primary education, as attendance at primary school is virtually universal.[39] The authors further suggest targeting potential dropouts in the transition from primary to secondary school, as well as allowing transfers to vary across beneficiaries depending on their expected response to the subsidy. For this, only observable, transparent, and non-manipulable indicators of non-enrolment risk should be used. The paper estimates that these changes would result in huge efficiency gains over the current poverty-based targeting. In particular, it would cost only 25 percent of the budget spent in 2000 (one billion US dollars) without increasing inequality among poor households.

Coady and Parker (2004) however find that the program's demand-side subsidies are still a more cost-effective option to improve access to education for poor households, than alternative supply-side interventions involving an extensive expansion of the school system. On the other hand, Coady (2006) shows that in terms of welfare returns, an alternative targeting focusing only on geographic location dominates demographic composition targeting, and that the latter in turn dominates household proxy-means targeting. Nevertheless, the latter's welfare

[39]Note that despite these suggestions, the grants for primary-school children have not only been kept, but they have been extended to include grades 1 and 2 in localities with less than 2500 inhabitants (SEDESOL (2013)).

contribution increases substantially as the program expands into better-off localities.

Likewise, Rubalcava and Murillo (2006) find that locality characteristics such as population size and marginalization indices influence poverty and the way in which households use their cash transfers. Therefore, they suggest that targeting take into account municipality-level characteristics, rather than only household characteristics. Additionally, the paper finds that even when female headed households are not always poorer, they have certain peculiarities that turn into disadvantages, and that the program does not take into account in any way.

Moreover, beneficiary women often recognized the existence of 'unequal responsibility' among people involved in the program. They felt, for instance, that genuine cost-sharing would mean teachers not missing classes so often, and being penalized if they did so. More generally, they criticized the lack of reliable accountability mechanisms where complaints regarding the behaviour of officials or professionals[40] could be processed (Molyneux (2006)).

Furthermore, health services have not been able to cope with the increase in demand generated by the program. In this sense, some evaluations have noticed deficiencies in the quality and availability of healthcare, including lack of personnel and medicines (Pastrana (2005); Molyneux (2006)). In any case, only basic preventive healthcare services are available in clinics in small towns,[41] and the infrastructure itself often consists only of a single room with no windows and no ventilation (Pastrana (2005)). In order to obtain more serious treatment, peo-

[40] In this regard, Adato et al. (2000), for instance, report having met non-beneficiaries in *PROGRESA* localities who described doctors not attending to beneficiary women who did not speak Spanish. The reason being that general practitioners, untouched by a child dying in her mother's arms, considered it a waste of time to doctor mono-lingual indigenous patients since the latter would not understand them, nor being able to read the prescriptions.

[41] There are no clinics whatsoever in small villages; beneficiaries residing there have to travel long hours to the towns where the clinics are located (Pastrana (2005)).

ple have to travel to bigger towns and pay themselves for the (costly) service (Molyneux (2006)).

Last but not least, there is evidence that *PROGRESA* has often been used for political ends. Specifically, beneficiaries denounce that they are often blackmailed into participating in political rallies of local candidates from the current, and former, national incumbent party, the PRI. If they refuse, they are threatened with being expelled from *PROGRESA* (Red Nacional de Promotoras y Asesoras Rurales (2000)). More recently, in April 2013, a set of recordings that second those, and more serious, claims was made public by the opposition party PAN.[42] Nonetheless, the latter was in turn accused by the PRI of conditioning the enrolment in *Oportunidades* to the prior registration of future beneficiaries as members of the PAN, while the latter held Mexico's presidency between December 2000 and November 2012.[43]

Academic research too has found evidence that politics, and not just poverty, have determined the allocation of *PROGRESA* among localities. For instance, Rocha Menocal (2001) finds that a greater proportion of households became *PROGRESA* beneficiaries in 1999 in states where the national incumbent party, PRI, had received a larger share of votes than the opposition in 1997, and where state elections were scheduled to take place in 2000.

Likewise, Takahashi (2007) shows that in 2000, prior to the presidential election, the federal government under PRI allocated higher *PROGRESA* expendi-

[42]Specifically, the videos show officials from all three government levels (municipal, state, and federal) along with PRI candidates and representatives in possession of electoral rolls of *Oportunidades*' beneficiaries organizing procedures for the massive use of government structures and resources to benefit the PRI in the then forthcoming elections in the state of Veracruz (see http://radioquintanaroo.com/pan-denuncia-uso-de-programas-de-sedesol-para-beneficiar-el-pri-en-eleccionesvideo/; http://aristeguinoticias.com/tag/casoveracruz/). The incumbent PRI then did "win" the said elections.

[43]See http://aristeguinoticias.com/2304/mexico/difunden-diputados-del-pri-las-grabaciones-contra-los-yunes/

tures to municipalities governed by PRI, and where the degree of party competition was higher. Finally, Green (2005) finds that a 10-percentage point increase in the 1997 PRI vote share in a given municipality increases the probability that that municipality was enrolled in *PROGRESA* by the end of 2000 by over 4 percentage points.

1.2.5.2 Empowerment

Although *PROGRESA* may "empower" women through managing the subsidy, it effectively naturalizes the social divisions through which gender asymmetries are reproduced and so, it reinforces the existent patriarchal structure. That is, by strengthening women's responsibilities for their children's welfare, the program confirms mothering as women's primary social role; any change in women's status occurs only within the traditional domestic division of labour (Molyneux (2006)).

Molyneux (2006, 439) thus suggests that, in order to move equality issues from rhetoric into practice, state policies should challenge, rather than deepen, the "unequally valued forms of social participation for men and women" regarding the organization of care work. Additionally, the author highlights the fact that women need, above all, a reliable income source and sustainable routes out of poverty. *PROGRESA* however does not address these needs; it does not provide, for instance, job training to help women to enter the wage labour market, nor nurseries to support working mothers.

Like this, Molyneux (2006) denounces that *Oportunidades* makes women dependent on a subsidy that, while it may enhance their social status and self-respect, "in doing little to help them secure sustainable livelihoods, puts them at risk of remaining in poverty for the rest of their lives" (p. 440). She goes on saying that: "stipends are no substitute for economic regeneration, and with-

out attention to the household livelihoods and long-term prospects of the poor, *including women*" (p. 441), poverty will not be eradicated. Indeed, as a civil servant at Mexico's Ministry for Social Development recognized, "the program is a 'container', it does not alleviate poverty, but it prevents people from starving".[44]

In sum, if *Oportunidades* seeks to have a stronger impact on women's empowerment, it should probably have a broader developmental approach to poverty reduction. It may thus include, for instance, alphabetization[45] and training programs for women, productive projects, and gender-sensitive education for men.

1.3 *Selfish* empowerment and first birth sex selection in Delhi, India

1.3.1 Introduction

The third chapter of this thesis analyses the effect of women's empowerment (*progressivity*) on the sex of the first child, and on the duration to first birth in India's National Capital Territory, Delhi. *Progressivity* may be seen as closely related to the selfish notion of women's empowerment as it highlights only conflictual elements of gender relations, but at the same time it stands on purely humanist grounds. Subsection 1.3.3.2.1 will detail the rationale for introducing this new concept.

Chapter 3 thus first constructs a women's *progressivity* / empowerment index using data from the third round of the Indian National Family Health Survey

[44]Quoted in Pastrana (2005).

[45]Note that it is not uncommon to find beneficiary women who are illiterate. Nonetheless, despite women consistently asking for *PROGRESA* to offer them educational programs to acquire basic literacy and numeracy skills, and doctors highlighting the importance of developing these skills for the program to be successful (Adato et al. (2000)), adult education in *PROGRESA* comes only in the form of the health talks.

(NFHS-3). Specifically, empowerment is measured in terms of whether women decide alone on their own healthcare; are free to visit the health facility on their own; do not justify wife beating under any circumstance; and think that it is justified to refuse sex to husbands under certain circumstances.

Four binary variables are first created indicating whether or not women are empowered / progressive regarding each of the above mentioned domains. Next, a continuous *progressivity* index is estimated using a latent factor model, which allows controlling for correlation between observed characteristics that may influence demographic outcomes, and any unobserved heterogeneity. The chapter then assesses the effect of women's empowerment / *progressivity* on the sex of the firstborn, and on the duration to first birth in Delhi.

The reason for focusing on Delhi is that, unlike other Indian states / territories, it has a distorted sex ratio (with missing girls) even for first order births. Furthermore, its child sex ratio[46] has not improved in the last decade. The results show that a one-standard deviation increase in the women's *progressivity* index increases the likelihood of a firstborn girl by 5.8 percentage points, compared to women who have not yet given birth. Additionally, more progressive women do not experience longer first birth intervals. These results are consistent with empowered women being less inclined to sex-select their first child in Delhi.

Lastly, the chapter estimates the firstborn's sex equation for two other Indian states: Kerala and Punjab. *Progressivity* is not found to significantly affect the probability of having (reporting) a firstborn girl in any of those states. This result is expected in the case of Kerala, as that state does not suffer from an imbalanced child sex ratio, but it is less expected in the case of Punjab, where a problem of 'missing' women does exist. Subsection 1.3.3.3 argues why individual-level

[46]That is, the number of boys in the age group 0-6 for every 100 girls in the same age bracket.

empowerment may be helpful in reducing existent gender inequalities in Delhi, but not in Punjab.

In a nutshell, that subsection contends that these findings highlight the relevance of the community gender context, which can be influential in negating or enhancing the effects of individual empowerment on well-being outcomes. That is, as Chapter 3 shows, women in Delhi are collectively more progressive than women in the rest of India, such that the context may further enhance the effect of individual *progressivity*. In contrast, progressive women in Punjab might not find a supportive environment that allows them to turn their progressive thoughts (e.g. defending the life of their daughters) into action.

This does not mean that there are no women with low *progressivity* levels in Delhi. There are (although less than in Punjab), and that may in fact partly explain why sex-ratios are unbalanced there, but the idea is that women who happen to be progressive enough as to want to keep a girl child, manage to do so because they may not be 'punished' by the community for not having conformed with the patriarchal social norms. This might be true, firstly because perhaps those rules are less entrenched in people's minds in Delhi; and second, because women there might not be known by the wider community. Therefore, collective action that aims at empowering communities of women (and instilling gender egalitarian thoughts in men) may have more far reaching benefits on reducing gender inequalities, than the increase in empowerment of isolated agents.

Clearly, community-level empowerment is obtained by the aggregation of empowered individuals, such that one may wonder which one came first. In the case of Delhi, being the National Capital Territory, the environment there may have always been more open-minded and liberal than elsewhere in India. Then, as new migrants arrive with their less progressive mindsets, they find a more progressive

environment and may thus, little by little, become themselves more progressive. Next, each generation born in Delhi may itself be more liberal, such that the overall context becomes each time more progressive. Subsection 1.3.3.3 provides suggestive evidence that something like this may indeed be at play.

1.3.2 Empowerment indicators in the Demographic and Health Surveys

Chapter 3 uses data from the third round of the Indian National Family Health Survey (NFHS-3), which is part of the Demographic and Health Surveys (DHS). The DHS provide information on population, health and nutrition for women, children, and men, and have been conducted in 90 different developing countries since 1984. Data from the DHS are representative at the national level and are also comparable across countries, as three near-identical core questionnaires are usually applied. Those questionnaires are: one for the household, one for women, and one for men (Kishor (2005)).

The third chapter in this thesis uses data from the women's core questionnaire of the NFHS-3. That survey was conducted in 2005-2006, it is representative at the national and state levels, and interviewed a total of 124,385 women aged 15 to 49 years. The chapter does not use previous rounds of the NFHS, conducted in 1992-3 and 1998-9 respectively, as they do not contain some of the questions that were used to create the *progressivity* index. Indeed, it was only in late 1997, starting from the *MEASURE DHS+* phase of the DHS project, when there was an increased effort to integrate gender into the surveys (Kishor (2005)).

At that point, advisory groups of gender experts were constituted to revise the

questionnaires. The process resulted in the addition in 1999 of four sets of gender-related questions into the women's core questionnaire, as well as in the inclusion of standardized modules on domestic violence, women's status, and female genital cutting. Nevertheless, the two latter modules have not yet been implemented in several countries, including India.

Still, the questions included in the post-1999 version of the women's core questionnaire are often used to develop female empowerment indicators. Those questions include: women's participation in household decision making; questions on gender-related hurdles in accessing healthcare; and two sets of questions on women's acceptance of gender-role norms that justify men's control over women. More specifically, the four sets of gender-related questions that were added to the women's core questionnaire in 1999 are:[47]

I. Who in your family usually has the final say on the following decisions:

- Your own healthcare?
- Making large household purchases?
- Making household purchases for daily needs?
- Visits to family or relatives?
- What food should be cooked each day?

Responses are coded as: Respondent; Husband/partner; Respondent and husband/partner jointly; Someone else; Respondent & someone else jointly; Decision

[47]Note however that in fact, not every DHS included all of these questions. The NFHS-3, for instance, lacks one of the household decision making domains (the one regarding what food to be cooked each day), one of the factors preventing women from getting medical advice or treatment (the one regarding knowing where to go), and one of the grounds for refusing sex (the one regarding having recently given birth). On the other hand, it contains two additional factors preventing women from getting medical advice or treatment (concern that there may not be a female health provider, and concern that there may be no drugs available); as well as two grounds for justifying wife beating (being suspected of being unfaithful, and showing disrespect for the in-laws).

not made/not applicable.

II. Many different factors can prevent women from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem or not?

- Getting money needed for treatment?
- Knowing where to go?
- The distance to a health facility?
- Having to take transport?
- Not wanting to go alone?
- Getting permission to go?
- Concern that there may not be a female health provider?

Responses are coded as: It is a big problem; It is a small problem; It is not a problem.

III. Sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations:

- If she goes out without telling him?
- If she neglects the children?
- If she argues with him?
- If she refuses to have sex with him?
- If she burns the food?

Responses are coded as: Yes; No; Don't know.

IV. Husbands and wives do not always agree on everything. Please tell me if you think a wife is justified in refusing to have sex with her husband when:

- She knows her husband has a sexually transmitted disease?
- She knows her husband has sex with other women?
- She has recently given birth?
- She is tired or not in the mood?

Responses are coded as: Yes; No; Don't know.

Additionally, there are other questions, which have been used in the DHS literature to create female empowerment / autonomy indicators. Those questions relate to physical freedom, and to access and control over economic resources. In the case of mobility, the following questions are asked in the women's core questionnaire:

Are you usually allowed to go to the following places alone, only with someone else, or not at all?

- To the market?
- To the health facility?
- To places outside the village?

Responses are coded as: Alone; With someone else; Not at all.
As for economic security, the following is asked:

- Would you say that the money you earn is more than what your husband earns, less than what he earns, or about the same?

Responses are coded as: More than husband; Less than husband; Husband has no earnings; Don't know.

- Who decides how the money you earn will be used: mainly you, mainly your husband, or you and your husband jointly?

Responses are coded as: Respondent; Husband; Respondent and husband jointly; Other.

- Who decides how your husband's earnings will be used: mainly you, mainly your husband, or you and your husband jointly?

Responses are coded as: Respondent; Husband; Respondent and husband jointly; Husband has no earnings; Other.

- Do you have any money of your own that you alone can decide how to use?

Responses are coded as: Yes; No; Don't know.

A brief, non-exhaustive, review of the literature that has used DHS data to create measures of female empowerment / autonomy follows. The survey may at times seem too detailed but that was needed in order to inform the reader about the different well-being achievements that have been investigated in the literature (e.g. women's versus child outcomes), the different empowerment indicators that have been used, the way in which they have entered the analyses and, lastly, to highlight the fact that variables such as education have generally not been used as direct indicators of empowerment. Instead, education has commonly been used in the literature as a simple socioeconomic characteristic.

Basu and Koolwal (2005) use data from the second round of the NFHS for the state of West Bengal[48] to go beyond the oft-mentioned multidimensionality of empowerment, and question instead whether those dimensions are indeed all measuring empowerment. Therefore, they explore the effect of both instrumental and selfish attributes and behaviours on the part of women on several well-being outcomes for the latter, as well as on child health indicators. In particular, nine

[48]Note that no explanation was given for choosing this particular state within India.

women's welfare outcomes are considered. These relate to their nutrition (whether or not women usually consume the following four sets of elite foods at least once per week: milk and curd, fruit, eggs and chicken, and meat or fish) and health (body-mass index, whether women sought advice for reproductive health problems in the last three months,[49] and three probabilities for lack of: anaemia, health problems after the last birth, and reproductive health problems in the last three months).

Four probabilities related to women's last pregnancy / child health are also investigated. These are: take-up of antenatal care, institutional delivery, child was born alive, and newborn does not suffer anaemia. Lastly, three probabilities regarding the newborn's immunization status are analysed. In particular, whether the child has had all recommended vaccines, none at all, or at least one.

Indicators of women's selfish / self-indulgent empowerment include: age, age gap between wife and husband, media contact (including newspaper/magazine and radio), wife does not need permission to visit family and friends, she decides on her own on her healthcare, she is allowed to have money set aside to use as she wishes, and she does not justify domestic violence.

Instrumental / responsibility indicators of women's empowerment on the other hand include: woman's contribution to total family earnings (four dummy variables), woman's decision making participation regarding what to cook and purchasing jewellery / other household items (two dummy variables per decision domain, one for deciding on her own and one for deciding jointly with others, leaving no participation as the reference category), and woman's freedom to go to the market (two dummy variables, one for being allowed to go with permission and one for not requiring permission, leaving not been allowed to go at all

[49]Note that for this outcome, all women were included, regardless of whether or not they experienced reproductive health problems in the previous three months.

as the reference category). The paper also controls for women's socioeconomic characteristics in the form of: location (rural / urban), caste, household standard of living, household size, sex of the household head, woman's and partner's educational attainment, and a pregnancy indicator.

The paper finds that women's selfish behaviours and attributes correlate more closely with women's improved food consumption and better reproductive health, than with child health outcomes. Moreover, several of the instrumental behaviour indicators are uncorrelated or negatively correlated with women's own welfare indicators, but they are positively correlated with child health outcomes. The latter in general are also significantly and positively associated with instrumental attributes. The paper thus points out the potential trade-offs between women's own health versus child health that may result from the presence of the two different notions of empowerment.

Desai and Johnson (2005) in turn use a cross-section of 12 countries to examine the effect of women's empowerment on child immunization, nutrition, and mortality. More specifically, the countries under investigation are: Benin, Egypt, Malawi, Mali, Uganda, Zimbabwe, India, Nepal, Haiti, Colombia, Nicaragua and Peru. Two outcome variables are investigated for 1-5 year-olds: the number of vaccinations received and the height-for-age standardized score. A third dependent variable is the probability of dying as a child (1-5 years old) for children born 5-10 years prior to the interview.

Maternal empowerment is measured through a dummy variable indicating whether or not women have the final say in at least one of the four following decisions. Making day-to-day household purchases, making large household purchases, obtaining healthcare for themselves, and visits to family and friends. Additionally, community-level empowerment is accounted for by including a variable

measuring the proportion of women in the sampling cluster who have the final say in making at least one of the decisions mentioned above. In particular, all women in the cluster who have had at least one child are included, regardless of the current age of their children. Socio-economic controls are: indicators for mother's and her partner's education, household wealth, child's birth cohort and urban residence.

The paper finds a positive effect of individual empowerment on children's height-for-age in all countries, but the effect on child immunization and mortality is geographically less consistent. Additionally, the paper shows that community-level empowerment is often more important on child health outcomes than individual-level empowerment. These results emphasize the relevance of the gender context on children's health achievements.

Matthews et al. (2005) in turn examine the role that women's autonomy play in the timely use of maternal services by women who have recently given birth, and who reside in the Indian state of Maharashtra. Specifically, they divide the sample into four groups: residents in the slums of Mumbai, residents in Mumbai not in slums, and those outside Mumbai (urban / rural Maharashtra). Three probabilities are investigated as dependent variables. In particular, whether: the first prenatal care visit took place during the first pregnancy trimester, women have had at least three antenatal care visits, and delivery took place in an institution.

Women's autonomy is measured in terms of whether or not women participate in the decision to: obtain healthcare for themselves, purchase jewellery and other items, and go and stay with their families; whether or not they need permission to go to: the market, and visit friends and relatives; and whether they are allowed to have money set aside to use as they wish. The study also controls for women's employment and education, their age, religion, media (TV and newspaper) contact,

their previous place of residence (urban / rural), and who heads the household.

The paper finds that women in urban Maharashtra have on average higher autonomy and more timely use of maternal care services than women in rural Maharashtra, regardless of whether or not they reside in Mumbai. Moreover, women in Mumbai's slums have higher autonomy and better access to timely maternal care than women in non-Mumbai urban areas. Similarly, the effect of the autonomy indicators on maternal care seeking behaviour is stronger and more consistent in slum areas of Mumbai, than in rural Maharashtra. These results show that the role that autonomy plays in the use of maternal services varies by whether or not meaningful healthcare choices are available.

Hindin (2005) explores the role that women's autonomy play in securing women's adequate nutrition in Zambia, Malawi, and Zimbabwe. These countries were chosen as they increasingly face a dual crisis: HIV/AIDS and acute food insecurity. Furthermore, women's nutrition is particularly relevant there as women are often the producers of food. The dependent variable is the probability that women have chronic energy deficiency (CED), which is defined as having body mass index (BMI) lower than 18.5.

Women's autonomy is measured using three continuous variables counting the number of decisions (out of a total of four for Zambia, five for Zimbabwe, and six for Malawi) in which: women have the final say, the partner has the final say, and women and partners have a joint say. Specifically, the decisions relate to own's health, large household purchases, and visits to family, friends, or relatives. Due to being available in their respective surveys, the following additional decision making domains were included in some cases. The number of children to have and when in Zambia and Malawi, and daily household purchases and food to be cooked each day in Zimbabwe and Malawi.

Furthermore, the gender context / women's status in society is accounted for by including an index of the number of domains (up to a maximum of five) where women see wife beating as justified. The paper also controls for women's individual status by including the age, educational, and occupational differences between them and their husbands, as well as an indicator of whether or not they have ever been beaten by their partners.

The paper finds that women with lower autonomy (i.e., those in households where partners make more decisions on their own), are at an increased risk of CED in Zambia and Malawi, but not in Zimbabwe, where female autonomy is substantially higher. Nonetheless, making more decisions on their own, or having no participation at all from their partners also marks women in the former countries as nutritionally disadvantaged. This makes sense if no participation means that partners are unable, or unwilling, to contribute to the household. These results highlight the importance of the gender context. They suggest that complete decision making autonomy in communities where such autonomy is not the norm, may isolate women and increase their disadvantage rather than decreasing it.

Mumtaz et al. (2005) examine how gendered access to resources and couple dynamics impact condom use at the most recent sexual encounter among men and women in Uganda and Zimbabwe. These countries were chosen as they have relatively high rates of HIV/AIDS. Gendered access to resources is controlled for through an employment and occupation indicator, a media contact score (ranging from 0 to 6 and accounting for radio, TV and newspapers exposure), and a HIV/AIDS-specific knowledge score (ranging 0-9 and based on 9 questions).

Gendered couple dynamics in turn are measured in terms of the relationship status (married / living together); a level of communication score (ranging from 0-4 and including family planning and desired family size); control of women's

income; a women's participation in household decision making score (ranging from 0-4 and including decisions on large household purchases, daily purchases, visits to family and friends, and the food to be bought); an attitudes towards wife beating score (ranging from 0-5 and including beating if wife goes out without informing her husband, if she neglects the children, if she argues with her husband / partner, if she refuses to have sex, and if she burns the food); and an attitudes score regarding the acceptability of women refusing sex to their husbands (ranging from 0-4 and incorporating the following circumstances: if she is tired, if she has recently given birth, if she believes that his partner is unfaithful, and if he has an STI).

The paper does not find consistent support for the hypothesis that condom use is related to greater women's autonomy. However, access to resources, particularly in the form of HIV/AIDS-specific knowledge, does positively affect condom use. The socio-legal status of the relationship is also very important as condoms are least likely to be used during sexual intercourse within marriage. Furthermore, condom use is generally motivated by the need to prevent pregnancy rather than sexually transmitted diseases. In this context, the authors hypothesize that condom use may not necessarily be women's requirement, but instead reflect men's power over women with whom they want to have sex, but do not want to bear the responsibility for having children.

The main paper's finding is consistent with Becker (1997), who analyses the effect of women's empowerment on the use of contraception and the take-up of prenatal care in Zimbabwe. Women's empowerment is measured in terms of women's participation in household decision-making. Specifically, on: the purchase of household items, wife's work outside home, and the number of children to have. The results show that empowerment significantly improves the fit of the

pre-natal care equation, but has almost no affect on contraceptive use.

Lastly, Alfano et al. (2011) analyse the effect of maternal autonomy on children's school enrolment age in three Indian states: Andhra Pradesh (AP), Kerala, and Uttar Pradesh (UP). These states were chosen as they illustrate different educational realities in India. In particular, Kerala has very high rates of school enrolment and adult literacy, and a high average educational attainment. In contrast, UP has some of the lowest education outcomes in India, and AP is in between those two extremes.

Autonomy is measured in terms of four different spheres for a total of 19 binary measures. The spheres are: economic (women decide either alone or jointly with their husbands on what to do with their husbands' money, and women have money of their own that they alone can decide how to use); physical (women are allowed to go alone or jointly with someone else to: the market, the health clinic, and places outside the community); decision-making (women decide either alone or jointly with their husbands on: their own healthcare, small household purchases, large household purchases, and visiting family and friends); and emotional (women do not justify wife beating if wives: argue with their husbands, are disrespectful with the in-laws, go out without telling their husbands, neglect the house or the children, refuse to have sex with their husbands, do not cook properly, and if husbands suspect their wives of being unfaithful. Additionally, women justify wives refusing sex to husbands if the latter have a sexually transmitted disease or other women, or if wives are tired).

The paper also controls for child's birth order, mother's caste and religion, parental educational attainment, and household's wealth quintile. The paper estimates a latent factor model where the dependent variable, school enrolment age, is jointly determined with maternal autonomy. This was done as both variables

are modelled as being associated with the same parental and household characteristics.

The results show that autonomy is not associated with maternal, nor household's socio-economic characteristics in Kerala (except for maternal education), but that it is strongly correlated with those characteristics in the other two states. Furthermore, autonomy positively affects the school starting age in UP, but it is less important in AP, and not significant at all in Kerala. These results may highlight the role that the community gender context can play on children's well-being, and how it interacts with individual autonomy. That is, the latter may be less important in contexts where the norm is to prioritize children's education (e.g. Kerala), than in contexts where enrolling children at school at the recommended age (6 years old) is less common (e.g. UP). Note however that in this case, unlike the dependent variable in Chapter 3, enrolling children at school at the recommended age, albeit uncommon in some Indian states, may attract little opposition from others.

1.3.3 *Progressivity* and sex selection in Delhi

1.3.3.1 The outcome variable: Firstborn's biological sex

The existence of gender disparities in health and wellbeing has been well documented in the case of India (e.g. Das Gupta (1987)), including disparities in morbidity and mortality rates (e.g. Dreze and Sen (1995)) that contribute to skewed sex ratios. The role of women's empowerment / autonomy on those disparities, as well as on ideal family size, contraceptive use, and total fertility, all of which in a context of strong son preference may influence sex ratios, has also been

investigated using Indian data (see, for instance, Dreze and Sen (1995), Mason and Smith (2000), Schuler et al. (1995) and Mason and Smith (2000); and Dyson and Moore (1983) and Malhotra et al. (1995), respectively).

Nonetheless, apart from the rare newspaper article (mis)reviewing a book (Hvistendahl's (2011) one) and concluding that "female empowerment often seems to have led to more sex selection" (Douthat (2011)), I am not aware of any paper analysing the role of direct measures of women's autonomy / empowerment on the probability of having a boy / girl as an indirect measure of sex selection, or otherwise. Education, a so called "indirect" measure of women's autonomy / empowerment, is included, for instance, as a covariate in Bhalotra and Cochrane's (2010) study of sex selective abortions in India. Nevertheless, that paper does not deal with female empowerment / autonomy in any way.

Other authors use aggregated data at the district-, state-, or country-level to analyse the sex ratio itself as an indicator of women's empowerment / equity (e.g. Nangia (2005) and Nayak and Mahanta (2012)); or to assess the impact of sex ratios on various measures of women's status / roles including, for instance, the percentage of married women, the divorce rate, female labour-force participation rates, total fertility, etc. (South and Trent (1988)). Chapter 3 in this thesis is thus, to the best of my knowledge, the first study that investigates the impact of women's individual-level empowerment on the biological sex of children in a context of imbalanced sex ratios, and otherwise.

The importance of analysing what types of women are more likely to allow (report) the birth of a daughter in places with 'missing women' lies, on the one hand, on the negative consequences that such imbalance has on the girls who happen to be born. In particular, skewed sex ratios have been found to be positively correlated with increased bride buying (see, for instance, Das Gupta and

Shuzhuo (1999), Blachet (2005), and Hvistendahl (2011)) and the abduction of girls (Kaur (2004)) / sex trafficking (Hvistendahl (2011)). In order to avoid the latter, parents try to marry off their daughters at a younger age (Kaur (2004)).

Child brides are however more vulnerable to domestic violence (Rao (1997), Mishra, (2000), Hindin (2002), Kaur (2004)), they are not sent to school by their in-laws, and are put under great pressure to get pregnant as to prove their fertility, all of which helps to perpetuate poverty (Otoo-Oyortey and Pobi (2003)). Moreover, young girls are at an increased risk of dying from pregnancy and labour complications (Mayor (2004)), and of giving birth prematurely and / or to low birthweight babies (Khashan et al. (2010)). The latter in turn contributes to a higher risk of neonatal and infant mortality and morbidity (McCormick (1985), Friede et al. (1987)).

Increased male-to-female sex ratios have also been found to be positively correlated with higher crime rates (Edlund et al. (2007)). Furthermore, 'surplus' men (unmarried, low-status, and young) may be more prone to abuse drugs (Kaur (2004), Tucker et al. (2005)) and to engage in risky sexual behaviours (Scott et al. (2012)), both of which would lead to an increase in HIV/AIDS infection rates (Tucker et al. (2005)). Moreover, 'surplus' males may also pose a threat to international peace should their governments fail to engage them in productive activities at home (Hudson and den Boer (2004)).

On the other hand, the topic in Chapter 3 is relevant for the analysis of women's empowerment given what Kabeer (1999) calls the "problem of values" in that literature. Specifically, she asserts that achievements, as relevant aspects of empowerment,[50] can in general be divided into two: on the one hand basic

[50]Empirically, one could analyse the impact of women's empowerment on well-being achievements (or on gender differentials in those outcomes), or aggregate individual achievements and use them as empowerment indicators themselves.

fundamentals of survival and well-being (e.g. nutrition, morbidity, mortality or, perhaps more generally, life expectancy, etc.), and on the other, other valued functioning achievements (e.g. political representation).[51] The latter however run the risk of representing *external* values (the researcher's), rather than women's own choices.[52]

In this sense, note that while allowing the birth of a daughter is a basic survival-related functioning, that outcome may also be seen as representing *external* values. That is, someone may argue that if women choose to abort the baby girl that is *their* 'free' choice, which we (researchers, outsiders) should respect, and even conclude -as Douthat (2011) does, that female empowerment (free choice) "leads to sex selection".

In this context, it is important to note three things. First, that Chapter 3 does not implicitly impose a normative restriction on what biological sex is best. That is, the chapter does not study the probability of giving birth to a baby girl versus a boy. Instead, it analyses both of those probabilities jointly (versus still being childless), using a competing risk model. This allows for female empowerment to potentially affect both probabilities, such that if more *progressive* women in Delhi happen, as they do, to be more likely to report a girl as the firstborn, that does not imply that they are selectively aborting boys.

Second, the topic in Chapter 3 is relevant because, as Kabeer (1999, 457) asserts, "the apparently 'voluntary' nature of such choices should not detract our

[51] The United Nations Development Program's Gender Empowerment Measure (GEM), for instance, focuses only on the latter. It includes the proportion of seats held by women in national parliaments, the percentage of women in economic decision making positions (including administrative, managerial, professional, and technical occupations), and women's income share as a proportion of men's income in the same jobs.

[52] A contemporaneous illustration of this risk could be the declaration of the "International Topless Jihad Day" on the 4th of April 2013 by activists of the Ukrainian feminist group FEMEN who, based on *their* external values, aimed at encouraging their Muslim 'sisters' to liberate themselves from oppression by choosing not to wear headscarves.

attention from their consequences". And third, as Subsection 1.3.3.3 highlights, we should not forget the relevance of the gender context in the study of women's empowerment. That is, even if women seem to 'freely' choose to abort a female foetus that should not, unlike Douthat (2011), automatically be labelled "empowerment" (free choice), without alluding to the context in which such said 'free' choice is taking place.

Instead, as Kabeer (1999) suggests, we should note two things. First, that that sort of discriminatory behaviour against other females may be the result of women's own internalization of their status as persons of lesser value in society; and second, that social values play a crucial role in justifying both the subordinate status of women, and the latter's own internalization of those values. That is, as Kabeer (1999) notes, power relations are not only expressed through the exercise of agency and choice, but also through the *kinds* of choices people make. Dominance operates through coercion and conflict, but also through consent and complicity. Because of this, Kabeer (1999) suggests accounting for structural parameters in the analysis of empowerment by qualifying choice in terms of the conditions in which it takes place, its contents, and its consequences.

Lastly, note that in the context of 'missing' girls, allowing the birth of a daughter may be seen as a valued achievement that goes against the norm, and that helps to transform prevailing inequalities (abnormally high male-to-female sex ratios), rather than reinforcing them or leaving them unchallenged. This adds to the relevance of studying the biological sex of children as an outcome variable for the women's empowerment literature.

1.3.3.2 The main independent variable: *Progressivity*

Once a researcher has decided to (try to) measure women's empowerment / autonomy, there are three main decisions that need to be made. First, decide what indicators to use; second, decide how to code them; and third, decide whether each indicator is equally cogent for empowerment and so, whether each of them should have the same weight in the estimating equation. This subsection seeks to justify the decisions made in Chapter 3 regarding each of those matters. In particular, Subsection 1.3.3.2.1 explains the need for introducing the concept of *progressivity* based on the first two points mentioned above. Subsection 1.3.3.3 in turn deals with the third issue and outlines the chapter's findings.

1.3.3.2.1 Conceptualization and measurements

Chapter 3 introduces the notion of *progressivity* which, in the context of female empowerment, is defined as "favouring the advancement of women towards improved conditions in society". In that definition, the qualifier *improved* needs to be highlighted. This is because the variables used to measure *progressivity* are only those behaviours and perceptions that testify of married women's ability to preserve their basic human rights (e.g. the right to a healthy life, free from violence, AIDS, and in general from sickness) / integrity, without acquiring responsibilities towards others, except perhaps towards themselves.

As those beliefs and behaviours from the part of women may directly erode their husbands' power over them, they may be potentially contested by men and thus, trigger intra-household conflict. Because of this, *progressivity* may be seen as closely related to the selfish notion of empowerment. Nonetheless, the crucial

difference between the two concepts is that the *progressivity* indicators can be defended from a pure human rights perspective. Specifically, the variables used in Chapter 3 to measure *progressivity* are:

- Whether women decide on their own healthcare.
- Whether women are free to visit the health facility unaccompanied.
- Whether women do not justify wife beating under any of the following circumstances. If the wife: goes out without telling her husband; neglects the house or the children; argues with her husband; refuses sex to her husband; does not cook properly; shows disrespect for her in-laws; or if her husband suspects her of being unfaithful.
- Whether women think that it is justified for a wife to refuse sex to her husband under each of the following circumstances. If she is tired or not in the mood; if her husband has a sexually transmitted disease; or if her husband has other women.

Noticeably, each of those measurements involves gender interactions that may potentially affect women's health / physical integrity. This is relevant as the final goal of Chapter 3 is to assess the influence of *progressivity* on the sex of the firstborn in a context of 'missing' women. That is, in a context where the dependent variable aims to provide some insight about the incidence of sex-selective abortions which, if present, would undermine women's health / physical integrity, even if women agreed on undergoing such a procedure. But again, it is important to highlight that any humanist, male or female, would defend each of those *progressivity* indicators.

The need of introducing the notion of *progressivity* is also due to the conceptual differences between women's "empowerment" and "autonomy", as well as between the instrumental and the selfish notions of empowerment or, more generally, to

the current theoretical debates regarding what "truly" represents empowerment. In this sense, note that it would not have been correct to claim that by using the four measurements listed above I was trying to account for women's "autonomy", because in that case, other measurements regarding, for instance, women's "ability to go to the market" on their own would have had to be included. This is because being able to move around freely confers physical autonomy to women, regardless of where exactly they are going to. Having the "final say on small household purchases" (e.g. food), would equally have had to be included. However, there are several critiques regarding the use of such variables as indicators of empowerment.

First, as Kabeer (1999) notices, in traditional patriarchal cultures there is usually a hierarchy of decision-making responsibilities recognized by the family and the community, which reserves some areas of decision making for men, as household heads, and assigns others to women in their capacity as mothers, wives, etc. Thus for instance in South Asia, deciding what food to purchase and cook generally falls within women's decision making domain, while "decisions related to the education and marriage of children, and market transactions in major assets tend to be" male (Kabeer (1999, 446)). Indeed, Sathar and Kazi (2000) find that in Pakistan, the only decision-making arena in which women have the major role is in the purchase of food. Adato et al. (2000) show that the same is true in the case of women in certain poor (*PROGRESA*) communities in Mexico.

This socially-based assignment of decision-making *responsibilities* is clearly due to the different domestic roles that cultures ascribe to people depending on their biological sex. For instance, cooking and cleaning is generally women's *responsibility*. Therefore, they are "allowed" / expected to make decisions about food (what to purchase and cook) as well as, probably, to be allowed to go to the market on their own. Nevertheless, as Kabeer (1999) notes, evidence of women

playing a role in making decisions which have little consequential significance on their lives (unlike strategic life choices), or that were assigned to them anyway "by the pre-existing gender division of roles and responsibilities, tell us far less about" women's power to choose "than evidence on decisions which relate to strategic life choices, or to choices which had been denied to them in the past." (p. 447).

Moreover, Basu and Koolwal (2005) highlight the fact that decision-making entails not (only) freedom, but often (only) *responsibilities*, such that in fact, they argue, some of the women's empowerment indicators that are often used in the literature do not really represent empowerment (e.g. women's participation on deciding what food to purchase / cook or on seeking medical attention for their children). That is, "having a say on" does not necessarily mean "having full rights on", but rather "being *responsible for*", such that those decision-making indicators might not measure "the woman's freedom to make her own decisions as much as" her "ability to make *certain types* of decisions and the responsibility to make *only* these kinds [of] decisions" (Basu and Koolwal (2005, 17)).[53]

To illustrate this issue, Basu and Koolwal (2005) suggest rephrasing questions on women's decision making ability as whether women can choose to neglect making those decisions (and bear no negative consequences). If they can, then perhaps we can tell that those women are "empowered"; but the simple fact that they participate in those decisions does not really measure empowerment. This aspect is even more salient when completely empowered women are defined as those who have *full rights* to decision making. Instead, the authors argue, what that really means is probably that they have *full responsibilities* on a matter, with their husbands abdicating their share of responsibility. Autonomy indicators may thus have different implications for families and for women themselves.

[53]The emphases in italics are mine.

This is precisely why Basu and Koolwal (2005) suggest differentiating between indicators of "selfish" versus "instrumental" empowerment; where, in their view, the latter does not really represent empowerment, but rather simply gives women the *responsibility* and the technical ability to become better wives and mothers, and thus to improve family welfare. Additionally, as Kabeer (1999) notes, we should also distinguish between 'control' (policy-making) and 'management' (decisions regarding policy implementation). The latter provides Chapter 3 with another ground for including only women's participation in decision-making regarding healthcare for themselves, and physical freedom to go to the health clinic on their own, and excluding other decision-making and mobility indicators.

That is, apart from being of little consequence for women's lives, to have been assigned to women by the existent gender division of roles and, to be simply measures of instrumental empowerment, rather than of "true" (selfish) empowerment, I would even claim that women's participation in decision-making regarding small household purchases (e.g. what food to purchase and cook) may indicate some "control" from the part of women only up to a point. For instance, suppose that suddenly, a mother decided to become vegetarian (carnivorous) in a carnivorous (vegetarian) household. Would she then be able to impose her new nutrition style upon her whole family? Probably she would not. In fact, there is anecdotal evidence[54] involving non-vegetarian women from Southern India who, after marrying vegetarian men in the North of the country, have to become themselves vegetarian, rather than the other way around.

On the other hand, the last two *progressivity* measurements are attitude questions. They give an indication of the spread of critical consciousness among women. That is, of the extent to which women question the traditional gender-role

[54]See http://www.bbc.co.uk/news/world-south-asia-13331808

norms that give husbands rights over the behaviour and the bodies of their wives. These measurements are important because, as it was pointed out in the previous subsection, power also operates through people's preferences and values such that, as Kabeer (1999, 441) explains, "a more critical consciousness only becomes possible when *competing* ways of 'being and doing' become available as material and cultural possibilities, so that 'common sense' propositions of culture" (e.g. husbands' power over wives, including their "right" to beat them and to control their bodies) "begin to lose their 'naturalized' character, revealing the underlying arbitrariness of the given social order."

Let us turn now to the second matter listed at the beginning of this subsection. That is, to the decision on how to code the *progressivity* measurements. Such decision is related to the first one, i.e. to the decision on how to measure *progressivity*, which in turn depends on the *progressivity* concept itself. In this context, note that another reason why other decision-making variables were not included as *progressivity* indicators is that, even if they were measuring not only women's responsibility, but also their fee choice, it is not clear that "full" autonomy / empowerment is really beneficial for women.

That is, would not be better to reach an agreement, through interaction and negotiation, between husband and wife than one of the parties (even if it was the wife) making all decisions? Even in issues where no responsibility was involved, but rather simple preferences? Would not such an agreement require a higher level of maturity from both parties, and the ability to compromise in a responsible way without the need of fighting, and thus be more aspirational than having "the final say" on a given subject? This issue is open to debate and the researcher's opinion about it will be reflected in the way empowerment indicators are coded.

This is another reason why Chapter 3 uses only the indicators outlined at the

beginning of this subsection and not others. That is, while in the case of areas such as the purchase of small / major household items it is clear that women "having *a* say" entails them having less power / responsability within the household than if they had "*the* final say" (and so, those response options would probably need to be coded differently), it is not clear that in those particular cases "having the final say" or "deciding alone" is necessarily better than "having a say" or "deciding jointly with husband". Thus if Chapter 3 aimed at measuring women's "autonomy" / "(em)power(ment)", those variables would not only need to be included, but the different response options would probably need to be included separately (unlike Alfano et al. (2011)).

Because of this, Chapter 3 includes only variables where it can be claimed that women "deciding on their own" is better than just "having a say" / "deciding jointly with husband" and so, they can be coded accordingly. Those variables include only beliefs and behaviours that give an indication of women's ability to control their own health and bodies, and thus enjoy a healthy life, such that they can be defended from a purely humanist perspective. Therefore, a binary variable was created for each indicator, ω_q, q=1,...,4, with values equal to 1 if a woman is progressive and 0 otherwise. Specifically:

$\omega_{i1} = 1$ if woman i decides alone on her own healthcare; 0 otherwise.

$\omega_{i2} = 1$ if woman i is allowed (by her husband) to go alone to the health facility; 0 otherwise.

$\omega_{i3} = 1$ if woman i believes that a husband is not justified in beating his wife under any of the seven circumstances mentioned at the beginning of this subsection; 0 otherwise.

$\omega_{i4} = 1$ if woman i thinks that a wife is justified in refusing sex under each of the three circumstances mentioned at the start of this subsection; 0 otherwise.

Given the humanist nature of the *progressivity* notion, note that in the last two cases progressive women are only those who do not agree on any ground for wife beating / potential rape. Additionally, it could also be argued that truly progressive women would not accept such obvious gender inequalities in power. Before turning to the empirical estimation, and thus to the point regarding the weights that each *progressivity* measurement should have in the final equation, the next subsection defends the decision of not including education as a *progressivity* indicator.

1.3.3.2.1.1 The debate on education

Women's education is not included as a measure of empowerment (*progressivity*) in the previous subsection. The literature provides both theoretical and empirical support for this decision. Moreover, given the outcome that is analysed in Chapter 3, and the context in which it takes place, there are additional conceptual and empirical reasons for not including education as an indicator of *progressivity*.

Firstly, from a theoretical perspective, Stromquist (2002) argues against an uncritical acceptance of education's empowerment potential. In her view, empowerment consists of four dimensions: cognitive (a critical understanding of one's reality), psychological (a feeling of self-esteem), political (awareness of power inequalities and the ability to organize and mobilize), and economic (the capacity to generate independent income), which jointly enable women to act on their own behalf. Given this framework, she contends that although an educational setting has the potential to foster all four dimensions, programs need to be designed explicitly to achieve each of those goals.

Therefore, whether or not education is empowering depends on the objectives

particular programs seek, the forms they take, and the instructional modes they use (Stromquist (2002)). Some educational materials may, for instance, deepen sexual stereotypes and conceptions of masculinity and femininity that limit the social potential of women. Specifically, they may contain gender-stereotyped images of men's and women's roles in society, and / or present only culturally acceptable materials that leave patriarchal ideologies and the existing sexual division of labour unchallenged. Likewise, school teachers may themselves have sexist attitudes that affect classroom practices and children's performance and career expectations (Stromquist (2002)).

Empowering girls should thus mean offering them courses with content that not only attacks current sexual stereotypes, but also provides them with alternative visions of a gender-free society. Girls empowered in this way would then participate more in class, not be intimidated by boys, and speak their own minds (Stromquist (2002)).

The author also argues that raising consciousness about the need to challenge asymmetrical gendered power is more important for determining women's agency than the simple ability to code and decode print. In this context, women-led non-governmental organizations may have a greater potential to empower women by offering informal educational programs explicitly aimed at raising such consciousness (Stromquist (2002)).

Likewise, Basu and Koolwal (2005) contend that education may indeed be a sort of empowerment, but only of instrumental empowerment. That is, education may "empower" women for the benefit of others, e.g. their children. It may, for instance, teach women to recognize the first signs of illness, provide them with information on the medical facilities in their area, and teach them the discipline to follow instructions from medical practitioners.

In this sense, they argue, education may be a sort of empowerment if by that we mean "the ability not to be flummoxed by written (or even oral) instructions, but it is not if we use the term to refer to the freedom to make choices" (Basu and Koolwal (2005, 17)), where freedom means the expansion of choices and freely made choice. Thus if a woman can (is allowed to) go to the market on her own, makes decisions about what to cook and about taking her sick children to the doctor, she might be autonomous / empowered, but only in a technical (instrumental) sense. That is, in the sense that if she can read, go to the market, and take a child to the doctor, she is more exposed to information and thus more likely to get a child medically treated (Basu and Koolwal (2005)).

Nevertheless, will an educated woman be *truly* empowered? That is, will she be able to choose freely? To answer this, Basu and Koolwal (2005) suggest wondering whether women would be penalized for making choices contrary to what is commonly believed to be a demonstration of freedom. For instance, suppose that an educated woman did not take charge of her children's health or of the food to be consumed by her household, could she excuse herself by claiming that she is exercising her freedom and get away with it? Perhaps not, as she knows that there are certain expectations of her, as an educated woman, from her family, the society and increasingly, from the state (Basu and Koolwal (2005)).

Additionally, as it was already mentioned in Subsection 1.2.3.1, empirical studies too provide support for not including education as an empowerment / autonomy indicator. Those studies (e.g. Jejeebhoy (2000), Frankenberg and Thomas (2001), Matthews et al. (2005) and Alfano et al. (2011)) may include and refer to education as a "setting" variable (along with co-residence with in-laws, age at marriage, etc.), which can then be a determinant of "direct" measures of empowerment (e.g. women's participation in intra-household decision-making, mobility,

incidence of domestic violence, etc.). In other studies, education is referred to as an indicator of women's (socio-economic) "status" (e.g. Kishor and Nietzel (1996) and Sathar and Kazi (2000)); "enabling" factor / "indirect" measure of empowerment (e.g. Kishor (2000)); or as a simple socio-demographic characteristic (e.g. Hindin (2005)).

Furthermore, in the case of *progressivity*, education cannot be used as an unambiguous indicator of it because there are people, men and women, with no formal education, who nonetheless have very progressive, egalitarian (as opposed to retrograde / backward) views on gender. Similarly, sexist ideas survive among highly educated people. Additionally, given the notion of *progressivity* and the outcome variable that is analysed in Chapter 3, only measurements involving gender interactions that may potentially affect women's health are used. Women's educational attainment does not fall in that category.

Lastly, some studies have found that education positively correlates with sex-selective abortions in India. This may be because more educated women have more information, access to sex determination and abortion facilities, and are more likely to plan their families (Retherford and Roy (2003)). In this context, including education as an empowerment indicator runs the risk of the researcher finding precisely what Douthat (2011) concluded, that "female empowerment leads to sex selection". But again, such inclusion may not be correct as it overlooks the importance of the context where education is taking place. Thus, following Stromquist (2002) one may inquire: is such education raising women's critical consciousness? Or is it, on the contrary, simply domesticating women, as Sudha and Rajan (1999) suggest?

In sum, it is not evident that education should be included, nor how it should be coded, as an empowerment / *progressivity* indicator. Whilst in the case of the

four *progressivity* measurements in this subsection it is clear how a progressive woman should look like (a value of 0 if non-progressive, and a value of 1 if progressive), what values should be given in the case of education? What level of formal education will grant a woman the adjective of "progressive" (versus retrograde)? Or should we code as 0 (non-progressive / backward) both extremes and leave women with "some" education (e.g. primary completed) as progressive? It is not clear.

1.3.3.3 Estimation and results

After creating a binary variable for each *progressivity* indicator as explained in the previous subsection, Chapter 3 estimates a *progressivity* index using a latent factor model. The latter allows controlling for correlation between observed characteristics that may influence demographic outcomes, and any unobserved heterogeneity. The index is then used to assess the effect of women's *progressivity* on the sex of the firstborn and on the duration to first birth in Delhi.

The latent model can be summarized by the following system of equations.

$$\omega_{iq}^{*} = \lambda_{0q} + \lambda_{1q}\alpha_i + \vartheta_{iq}, \qquad q = 1, ..., 4, \qquad \text{with} \quad \omega_{iq} = \begin{cases} 1 \text{ if } \omega_{iq}^{*} > 0 \\ 0 \text{ otherwise} \end{cases} \tag{1.1}$$

$$\alpha_i = \mathbf{z}_i'\gamma + u_i \tag{1.2}$$

Where:

ω_{iq}, $q = 1, ..., 4$ are the four binary *progressivity* indicators, as outlined in the previous subsection.

α_i is woman's i true, latent, level of *progressivity* (i.e. an unobserved heterogeneity term) which depends on some observed characteristics, $\mathbf{z}_i'$ (e.g. age at

marriage, current age, age difference between spouses, education, caste, religion, etc.)

Under certain credible assumptions, as detailed in Subsection 3.3.2, these equations are jointly estimated through maximum likelihood to obtain the Bayesian shrinkage estimator (Goldstein (2003)). That is, the estimated posterior conditional mean of the latent variable, $\hat{\bar{\alpha}}_i \equiv E(\alpha_i | z_i, \omega_{iq})$, $q = 1, ..., 4$. That estimator is standardized in Chapter 3 and used as the main independent variable in the firstborn's sex and first birth interval equations.

This procedure to estimate an index is not very common in the women's empowerment literature. What is more common is to obtain an index as the sum of the values of the individual empowerment indicators,[55] or as their arithmetic mean. Such index can either be an overall one (e.g. Kritz et al. (2000)), or separate indeces can be created by empowerment / autonomy domains (e.g. physical, economic, decision-making, etc.) (see, for instance, Sathar and Kazi (2000), Jejeebhoy (2000) and Mumtaz et al. (2005)). Alternatively, a set of dummy variables for each empowerment / autonomy indicator can be entered as independent variables in the final equation (e.g. Basu and Koolwal (2005), Desai and Johnson (2005) and Matthews et al. (2005)).

The estimation methodology used in Chapter 3 is however similar to the one found in Alfano et al. (2011)). That paper uses a latent factor model for women's autonomy, but equations equivalent to the two shown above are estimated jointly with a third equation for the outcome variable (age at first school enrolment).

[55] The measurements can either be dummy variables like in this thesis (i.e. 0=not empowered / autonomous / progressive; 1=empowered / autonomous / progressive), or take higher values depending on how progressive / autonomous / empowered the woman is. For instance, one could assign a value of 2 if the woman makes the final decision on a given matter on her own / does not need permission to go to a certain place; 1 if she usually participates in the decision but does not have the final say / requires permission to go to a certain place; and 0 if she does not participate at all / is not allowed to go at all. This latter methodology is used, for instance, by Jejeebhoy (2000).

In contrast, Chapter 3 estimates the *progressivity* index separately, which allows comparing the results in a more straightforward way with other specifications that account for empowerment in alternative ways. Those specifications use either a simpler index (ranging from 0 to 1 and giving the same weight to each indicator), or a set of four dummy variables, one for each *progressivity* measurement, in the firstborn's biological sex equation.

The reason why Chapter 3 focuses on the sex of the firstborn is due to the existent disagreement on whether sex selection is used for first order births in India (see, for instance, Retherford and Roy (2003), Jha et al. (2006) and Poertner (2010)). Furthermore, the chapter focuses on Delhi after showing that, unlike other states / territories in India, it has an unnaturally high sex ratio even among first order births. Furthermore, unlike Punjab and Haryana for instance, its child sex ratio did not improve during the last decade. This is very important as India's male-to-female child sex ratio has experienced a sustained increase since the Independence in 1947 (Registrar General (2011)).

Using the estimation procedure described in this subsection, Chapter 3 finds that a one-standard deviation increase in the women's *progressivity* index is associated with a 5.8-percentage point increase in the likelihood of a firstborn girl relative to women who have not yet given birth. Additionally, more progressive women do not experience longer first birth intervals. These results are consistent with more progressive women being less inclined to sex-select their first child in Delhi. This is the preferred estimation methodology as it accounts for any potential correlation that may exist between women's unobserved heterogeneity (*progressivity*) and their observed characteristics. Moreover, it does not impose any weight *a priori* on the individual *progressivity* indicators.

In any case, Chapter 3 also provides estimates of the firstborn's sex equation

using a simpler *progressivity* index on the one hand, and *progressivity* dummy variables on the other. The simpler index is the arithmetic mean of the four *progressivity* binary indicators. In that case, the results show that a "fully" empowered woman (i.e. one who decides by herself on her own healthcare, is free to go on her own to the health clinic, does not justify wife beating under any circumstance, and thinks that refusing sex to husbands under certain circumstances is justified) is 8.3 percentage points more likely to report a girl as the firstborn compared to women who have not yet given birth, and who are not progressive at all as measured by the four *progressivity* indicators previously described.

On the other hand, if each *progressivity* indicator is entered directly into the firstborn's sex equation, only the first measurement, whether women decide by themselves on their own healthcare, significantly affects the (reported) firstborn's sex. In particular, women who have the final say regarding their own healthcare are 4.9 percentage points more likely to report a firstborn daughter compared to women who are still childless, and who let others decide on the use of healthcare for them.

Lastly, Chapter 3 estimates the firstborn's sex equation for two other Indian states, Kerala and Punjab, using the latent factor model described in this subsection. Kerala does not suffer from an imbalanced child sex ratio and thus, *progressivity* is not expected to affect the biological sex of firstborns there. Punjab in contrast does have a problem of 'missing' girls. The results show that individual *progressivity* does not significantly affect the firstborn's sex in any of those states. This result is expected in Kerala given its egalitarian gender context. Moreover, the reason why individual empowerment may help to reduce existent gender inequalities in Delhi, but not in Punjab, may also be due to structural considerations.

The latter result is very important as previous literature has underlined the importance of the gender context while seeking to explain, either differences in the spread of gender inequalities between the Southern and the Northern/Western regions in India (e.g. Dreze and Sen (1995)), or differences in women's autonomy itself between states in those two regions (e.g. Dyson and Moore (1983), Jejeebhoy (2000)). Nevertheless, the results in Chapter 3 suggest that the gender context may be important in enhancing or negating the influence of individual-level empowerment on well-being outcomes (e.g. the probability of being born for boys / girls), even among Northern Indian states / territories, that display similar gender inequalities.

Kabeer (1999) refers to the gender context as the rules, social norms and practices that make up gender relations including, among others, those regarding marriage, mobility, and inheritance. Thus in Punjab, that structure might be far more important in determining the extent to which families value the girl child, than the individual characteristics of her parents and so, it may negate the effects of individual empowerment on the likelihood of allowing a girl to be born. This is because, in cultures of son-preference, women will secure greater respect, social status and family approval by giving birth to a certain number of sons, and in general by favouring them over daughters. In those cultural settings, female foeticide and infanticide might thus be 'rational' responses to social norms (Kabeer (1999)).

In this sense, looking at the estimated *progressivity* distribution in Delhi compared to that in Punjab (see Figure A3.1), one notes that in the latter there are many more women with very high *progressivity*, such that that variable is on average higher there than in Delhi (0.53 versus 0.47). Nevertheless, *progressivity*'s standard deviation is larger, and its median lower, in Punjab than in Delhi (0.33

versus 0.2, and 0.38 versus 0.44, respectively). This is because there are many less women in Delhi with very low *progressivity*, and many more with medium *progressivity*, compared to Punjab. Thus for instance, given a *progressivity* level of 0.4, 58 percent of women in Delhi are above that level, compared to just 47 percent of women in Punjab. Furthermore, the percentage of progressive women in Delhi is 35, 73, 62, and 77, compared to 48, 56, 39, and 73 percent in Punjab, as measured by each of the four progressivity indicators, respectively.

Given this setting, suppose that there is a *progressivity* threshold (e.g. 0.4) after which women are not ready to kill a daughter. In contrast, women with *progressivity* levels lower than that, in both states / territories, have already internalized their own subordinate status as persons of lesser value in society, such that they have a strong son preference and are ready to commit foeticide / infanticide; that is in part why there are 'missing' girls in both states / territories.

Additionally, suppose that women above that cut-off *progressivity* level are ready to defend their daughters, but only women in Delhi manage to transform their progressive thoughts into action due to living in a more open-minded environment. Indeed, note for instance that only 7 percent of women in Delhi live in rural areas, compared to 38 percent of women in Punjab. In any case, urban areas in Punjab might not be comparable to those in Delhi as Matthews et al.'s (2005) research in the context of Maharashtra suggests.

Living in Delhi may thus provide anonymity, such that even when patriarchal social norms do exist, they might not be that deeply-entrenched in the wider community anymore. Thus if a woman happens to be progressive enough as to wish to keep her daughter, the community will "support" her in the sense that, at least, it will not raise against her, perhaps in part because they do not even know her and so, it will not penalize her for not conforming to its norms. Therefore, we

are more likely to see those women having (reporting the birth of) a daughter.[56]

Larger structural change may thus be crucial as Kabeer (1999, 457) points out. That is, "in a context where cultural values constrain women's ability to make strategic life choices, structural inequalities cannot be addressed by individuals alone". She thus highlights the importance of women's organizations and social movements in creating the conditions for change, and in reducing the costs of not conforming to the social norms for individual women. The mass anti-rape protests that have taken place in New Delhi in the last months, and in which large numbers of men have also taken part, suggest that these conditions may, to some extent, already exist in Delhi, but perhaps not elsewhere in India.

Because of this, Chapter 3 estimates the firstborn's sex equation using the index obtained through maximum likelihood, but constraining the sample to women whose husband was interviewed. This was done in order to test the hypothesis that those women enjoy a more progressive and supporting environment at home, which may enhance the effect of women's *progressivity* on the girl equation.

That is, although couples who were interviewed are representative of all couples at the state and national level, that is only in terms of observable characteristics. Nonetheless, husbands must have made themselves available to answer the questionnaire, which may signal that they conferred importance to a demographic and health survey. They might thus be more progressive, supportive, and understanding than other husbands, *ceteris paribus*.

The results provide support for this hypothesis as the effect of *progressivity* on the probability of reporting a daughter as the first child is almost twice as large as in the baseline specification. Specifically, a one-standard deviation increase in the women's *progressivity* index is now associated with an 11.4-percentage point

[56]There might also be more tangible support available in the form of, for instance, refuges for women who suffer domestic violence, etc. But I do not have evidence of this at the moment.

increase in the likelihood of a firstborn girl, relative to women who have not yet given birth.

Therefore, collective action that aims at empowering communities of women, as well as instilling progressive thoughts in men, may have far more reaching benefits on reducing gender inequalities than the increase in empowerment of isolated agents. Clearly, community-level *progressivity* / open-mindedness, is obtained by the aggregation of progressive (men and) women, such that one may wonder which one came first. In this case, given that Delhi is the National Capital Territory of India, the median level of *progressivity* might have always been higher there than elsewhere in the country. Then, new migrant women who arrive from other states find a more progressive context, and little by little they themselves become more open-minded. Next, each generation of girls that are born in Delhi is each time more progressive, such that the context becomes each time more progressive.

In a sense, the data supports these hypotheses. Specifically, there is a variable in the dataset that gives us some information about who is a migrant. This is the answer to the question "how many years have you lived in the current place of residence". Under that definition, only 20 percent of women in the Delhi sample are non-migrants, as only those many answer that they have been living there "always". Next, looking at the variable that reports women's native language, we have that 99.6 percent of women in the sample speak Hindi as their mother tongue.

Therefore, it would be safe to conclude that the 80 percent of the sample who are migrants do not come from the gender egalitarian states of Tamil Nadu and Kerala in Southern India.[57] Instead, they may come from Uttar Pradesh and

[57] The official language in Tamil Nadu is Tamil (see https://en.wikipedia.org/wiki/Tamil_Nadu); and the two official languages in Kerala are Malayalam and English, the former being the main language (see https://en.wikipedia.org/wiki/Kerala).

Bihar.[58] Indeed, while Keralites migrate to countries in the Arabic Peninsula (e.g. Saudi Arabia and Kuwait) in search of work,[59] a report recently released by the Indian Institute of Human Settlement (IIHS) found that most migrants in Delhi come from Uttar Pradesh (47 percent) and Bihar (31 percent).[60] This is true not only for men, but also for women.[61] Those two states are associated with some of the starkest indicators of gender discrimination[62] in the Indian subcontinent (Dyson and Moore (1983), Kabeer (1999)).

Unfortunately, the NFHS-3 does not allow differentiating between inter-, and intra-state "migrants" (i.e. people who have not "always" been residing in the current place of residence). However, since 1994 Delhi's annual population growth has increased more due to newly arrived migrants than to natural population increase (Government of NCT of Delhi (2011)). Therefore, a large proportion of "migrants" may certainly come from other Indian states rather than from within Delhi. The hypothesis is thus that women with low *progressivity* levels might be recent migrants from states where the gender context is in general more retrograde than in the National Capital Territory (e.g. Uttar Pradesh and Bihar); but as they spend longer in Delhi they become more progressive.

The NFHS-3 provides suggestive evidence to support this hypothesis. Specif-

[58]The Encyclopaedia Britannica informs us that in Uttar Pradesh (UP), "Hindi is an official language of the state and the mother tongue of most of the people. Urdu, additionally an official language, is primarily spoken by Muslims." (See http://www.britannica.com/EBchecked/topic/620898/Uttar-Pradesh#toc281407); the same is true in Bihar (see https://en.wikipedia.org/wiki/Bihar#Language_and_literature).

[59]http://articles.timesofindia.indiatimes.com/2013-06-21/middle-east-news/40118402_1_migrants-oommen-chandy-saudi-arabia

[60]The report used information from the 2001 census, the 2007-08 National Sample Survey, and preliminary data from the 2011 census; as of 1 September 2013, migration data for census 2011 had not yet been released (see http://articles.timesofindia.indiatimes.com/2013-09-01/delhi/41661826_1_services-sector-bihar-migrants-delhi-government)

[61]Specifically, it is estimated that around 70 percent of female migrants in Delhi come from Uttar Pradesh and Bihar (see http://www.acralive.org/2010/12/most-migrant-women-in-delhi-work-in.html).

[62]This includes, for instance, infant and child mortality, prevalence of child marriage, literacy rates and incidence of domestic violence.

ically, women in the Delhi sample who have been living in their current place of residence for less than one year have an average *progressivity* level of 0.36. This rises to 0.43 for women who have been living in the same place for 1-5 years; 0.48 for those with 6-19 years of continuous residence; and 0.51 for women who have been living there for 20 years or longer.[63] This results in an overall average *progressivity* level of 0.47 in Delhi.

Nevertheless, although the results in Chapter 3 show that women's empowerment may help to reduce the extent of an existent gender inequality in Delhi, New Delhi is also known as the "rape capital" of India. This is according to the National Crime Records Bureau, which compares reported cases of crime from major Indian cities (e.g. New Delhi, Mumbai, etc.)[64] However, it might be that rape is more likely to be reported in New Delhi than in other cities due to stigma or because reporting might seem useless in smaller cities.[65]

In any case, if occurrence is in fact higher in Delhi / New Delhi than in other Indian states / cities, it may be due, partly, precisely to the clash between modernity and tradition that takes place there. That is, women in (New) Delhi may be more emancipated as they may move around more freely due perhaps to having a higher economic participation in the service sector compared to women elsewhere in India. Migrant men from other Indian states however may have a more retrograde mindset and be unhappy with women's emancipation, as they

[63] Women who have been living there "always" also have an average *progressivity* level of 0.51 on their own.

[64] See http://www.huffingtonpost.com/2013/01/04/india-rape-capital-delhi-self-defense_n_2406866.html

[65] This is known to be true at least in the country side of some Northern states like Uttar Pradesh and Rajasthan. Specifically, Burke (2013) reports that: "As in rural Rajasthan...women in the countryside of Uttar Pradesh suffer systematic sexual harassment and often violence. Rape is common and gang rape frequent. Victims are habitually blamed for supposedly enticing their attackers. Many are forced to marry their assailants; others kill themselves rather than live with the social stigma of being "dishonoured". Police rarely register a complaint, let alone investigate."

may see their masculinity threatened. This shock of mindsets may explain the high levels of violent crime against women in Delhi.[66] Indeed, note for instance that all of the six men involved in the shocking gang rape of a 23-year-old student in New Delhi last year are 'surplus' (unmarried, low-status, and young) migrant workers from remote parts of India in the states of Rajasthan, Uttar Pradesh, and Bihar (Burke (2013)).[67] In that case, backward mindsets may have collided with women's *progressivity*.

1.4 Understanding the divide between *instrumental* and *selfish* empowerment

In this section I claim that the reason why there exist two so different, even conflicting, notions of women's empowerment is due to the fact that major aid agencies' (e.g. the World Bank, some UN agencies, etc.) foremost concern has always been, even nowadays, to reduce fertility rates.[68] This means that, at least at the institutional level,[69] they might not be truly concerned about women's welfare / happiness, which in this section should be understood as a lack of suffering. Therefore, any goals that those organizations seek to achieve, including those

[66] In this regard, Aljazeera's documentary "Unintended consequences: India's rape crisis" is very telling; it can be watched at: http://www.aljazeera.com/programmes/101east/2012/04/201242482823627221.html.

[67] See http://www.theguardian.com/world/2013/sep/10/delhi-gang-rape-india-women

[68] Hvistendahl (2011) provides evidence not only of this interest among powerful international and American organizations such as the World Bank, the United Nations Population Fund, the Population Council, the Ford Foundation, and the Rockefeller Foundation in the 1970s, but also of how these organizations funded research aimed at developing foetal sex determination techniques, such as amniocentesis, which eventually bore fruit, in India.

[69] Surely there are individuals within those organizations, e.g. Monica Das Gupta at the World Bank, who truly care about women as individuals rather than as instruments to reach other goals; but at the institutional level the foremost concern is not to help women, but to reduce population growth.

aimed at empowering women (e.g. raising female education), might in reality be due to attain their final goal of reducing population growth. Such objective has historically made them advocate for, and support (i.e. fund), population policies in developing countries that, along with a strong son preference, have given rise to sex-selective abortions in countries like India (Hvistendahl (2011)).[70]

Although the current rate of population growth may not be sustainable environmentally speaking, it is unacceptable, from a humanist point of view, that the price for lower fertility be the suffering of women. Lower population growth should not come at the expense of women (literally), nor at the expense of the welfare / happiness of those girls who are allowed to be born and survive. That is, as it was pointed out in Subsection 1.3.3.1, part of the problem is that imbalanced sex ratios appear to have increased prostitution and human trafficking for sexual exploitation (Hvistendahl (2011)).

Despite these phenomena being widespread and causing huge suffering to the women involved, mainstream aid agencies have so far failed to put addressing those problems at the top of their priorities. This makes one wonder whether they really care about women's well-being. The extent of the problem is as follows.

1) There are around 163 million 'missing' women in Asia alone[71] (Guilmoto (2007)), 23 years after Amartya Sen (1991) published his "More Than 100 Million Women Are Missing" essay.

2) There are around 27 million people who have been trafficked for sexual or labour exploitation, i.e., living in slavery (Bales et al. (2009)), 150 years after slavery was "abolished".

In this section I identify some ideas that may contribute to solve these problems

[70] Details are given in footnote 68.

[71] There is evidence that sex-selective abortions also take place among Asian populations in the UK (Dubuc and Coleman (2007)) and in the USA (Almond and Edlund (2008)).

if they were inculcated in society. As spreading these thoughts would presumably give rise to lower fertility rates, mainstream development organizations might be willing to embrace them. Furthermore, as they may also increase people's happiness, they hope to be supported by human activists. Additionally, in order to face the problem in a more immediate term, some policy recommendations are made. The ideas are as follows.

1) We need a redefinition of masculinity. In particular, we need to fight the idea of masculinity being defined based on the number of sexual conquests. Instead, we may promote the idea that sex should only take place between two people who can communicate with and understand each other. This would, by definition, make prostitution, child marriage, child grooming, and domestic violence unacceptable.

In contrast, inter-racial, inter-religious, and sex-same relationships would be acceptable, as long as the parties understand each other. Moreover, given that violent husbands have often risen up themselves in a home where domestic violence was prevalent (e.g. Maldonado et al. (2006)), the more men can find *the* right woman (i.e. the one they can communicate with and are understood by), the happier and less violent they will be. This will benefit women and children. In order to support the first point, we also need to promote the following ideas.

2) Money is not important, communication is.

3) Humanism/Dignity: All human beings (regardless of their sex and cultural background) are equal (thus equally valuable and equally likely to be *the* right partner).

These ideas come from the realization that, although poverty often plays a role in the human trafficking for sexual exploitation phenomenon, the real problem is the demand (i.e. men). So unless the demand is reduced, which means involving men in the solution, there will be no real solution. The (unorthodox) idea is thus

to change men's preferences, such that even if they have the money to buy a girl, they choose not to do it.

It is true that there is a purely biological problem (the fact that men can obtain sexual satisfaction from *any* woman), but if we managed to spread the idea that mistreating women is coward rather than masculine, men who use women only for sexual satisfaction purposes should be a minority. But of course, in many places it is precisely the fact that there are 'missing' girls that causes 'surplus' men to demand prostitutes, so the two problems are connected.

On the other hand, married men also use the services of enslaved / groomed for sex girls.[72] This makes one wonder whether those men are happy in their marriages, and otherwise to guess why they got married in the first place. One possible reason to marry strangers might be that they belong to one's same religious group and/or community, and that marriage outside such circle is not supported by families.[73]

This underlines the importance of the structure, i.e., of the gender and cultural context as it exemplifies that males, and not only women, are expected to abide by the social norms of their communities. Because of this, we need to teach men and women in all cohorts and countries that culture is not as important as the happiness of their sons and daughters. Thus if the latter want to marry outside their communities, that should be supported as long as they can communicate with their partners and understand each other without fighting. On the other hand, parents might threaten to disinherit their children if the latter married

[72]This is true, for instance, for some of the UK nationals who were part of grooming gangs that have recently been brought to justice in the UK (see http://en.wikipedia.org/wiki/Rochdale_sex_trafficking_gang).

[73]This has been suggested by some interviewees in the BBC documentary "Exposed - Groomed For Sex" (available from http://www.youtube.com/watch?v=KkaPlDOE7X0), which investigates about child grooming gangs in the UK.

outside their community.[74] Therefore, element number 2 is crucial; but in order to achieve it, a change to a more humane, less materialistic, economic model is also needed.

This idea can already be seen in calls for the introduction of measures of happiness in indicators of countries' prosperity.[75] That is, instead of trying to maximize (per capita) GDP, if we cared about happiness, rather than money, we would, in my view, have to look at reducing domestic violence, human trafficking, and balancing sex ratios. I do not see any of those among the UN Millennium Development Goals.[76] After the next two paragraphs I will argue that this might

[74]This has been the experience of one of the interviewees in the BBC documentary "Welcome to India 2012 - Episode 1 of 3" (available from https://www.youtube.com/watch?v=IpdoRUMeshw)

[75]For instance, in 2012 the United Nations decided that wellbeing would be at the centre of new sustainable development goals, which are expected to replace the Millennium Development Goals when they expire in 2015 (see http://www.huffingtonpost.com/2012/06/11/united-nations-calls-for-_n_1582289.html). This decision was made at the High Level Meeting titled "Happiness and Well-being: Defining a New Economic Paradigm", which took place on the 2nd of April 2012 at the UN headquarters in New York, and that was hosted by the Royal Government of the Kingdom of Bhutan. That country has been promoting the adoption of a new, more sustainable, world economic system and introduced the concept of Gross National Happiness (GNH) in 1972 (http://en.wikipedia.org/wiki/Gross_national_happiness). At that point, it proclaimed that "GNH was more important than Gross National Product"; and in 2008 it developed a GNH Index that consists of nine domains: living standards, health, education, culture, community vitality, time use, good governance, and psychological wellbeing. To the best of its capacity, the country has been trying to put GNH in practice at home. Bhutan then initiated the UN General Assembly Resolution 65/309 titled "Happiness: Towards a Holistic Approach to Development", which was passed by consensus on 19th July 2011, and which gave rise to the 2nd of April 2012 meeting (see http://www.gnhc.gov.bt/wp-content/uploads/2012/03/Brochure-final-final.pdf).

[76]Likewise, policy recommendations from the 2nd of April 2012 UN High Level Meeting include, for instance, prioritizing investment in renewable energy, public transport and green spaces; introducing work sharing schemes that increase leisure time and prevent unemployment; discouraging materialism by banning advertising to children; and creating accounting systems that factor in the value of 'services' provided by the ecosystem. Although efforts to "incorporate traditional and indigenous knowledge; empower women; and ensure equality of opportunity" are also included (Royal Government of Bhutan (2012)), the main concern seems to be environmental. Like this, nothing is mentioned about the need to bring the world's sex ratio at birth down to its natural level (it is currently 107 boys per 100 girls), and even less about ending human trafficking. This might be because Bhutan, the country promoting the adoption of a new world economic system, does not have a problem of skewed sex ratios at birth. In particular, according to data published in 2012, that ratio was between 104 and 105 boys born for every 100 girls born depending on the data source (either from the Central Intelligence Agency's (CIA) World Factbook 2012, or from the World Bank's World Development Report 2012 (http://en.wikipedia.org/wiki/List_of_countries_by_sex_ratio)).

be because aid organizations' foremost aim is to reduce fertility rates.

First, let me make clear that in my view, female education should be supported as it allows girls to gain skills to, in theory, compete on par with men in the labour market. This would then contribute to weaken the belief that daughters are a liability for parents. However, in reality women are often discriminated against in the labour market, even in advanced economies, and/or after having gained valuable skills, they sometimes have to choose between having a career or a family. Therefore, I suggest that the new, more humane, economic system support families by offering, for instance:

4) Some paid maternity and paternity leave and free nurseries.[77]

If these four points were followed, we may expect to see an increase in the median age at marriage, a fall in fertility rates, and perhaps increases in educational attainment.

Nevertheless, the sort of support suggested in point 4 is not always available, not even in some industrialized countries.[78] This is partly because we, as a soci-

This is relevant as the non-binding policy recommendations that were made after the 2nd of April Meeting are largely derived from a list suggested by the government of Bhutan, and which was included in the meeting's final brochure (http://www.gnhc.gov.bt/wp-content/uploads/2012/03/Brochure-final-final.pdf). Nevertheless, note that even in Bhutan females seem to be disadvantaged compared to males, as the sex ratio for working age people (ages 15-65) is 113, and that for people aged 65 and over, is 112 (CIA World Factbook 2012, see http://en.wikipedia.org/wiki/List_of_countries_by_sex_ratio). This implies that, in contrast to what is observed in most countries, Bhutanese women have much higher mortality rates than males. Furthermore, there are also criticisms regarding Bhutan's suppression of its largest minority, the Hindu Lhotshampa, who were expelled in mass after new citizenship laws were passed in 1985; the few who remained in the country are allegedly discriminated against (http://www.dol.govt.nz/publications/research/bhutanese-refugee-resettlement/bhutanese-report3-2.asp).

[77] This may be ensured, for instance, perhaps for up to two children (the total fertility rate needed for ensuring population replacement) per family. In any case, this may not bankrupt the state given that it is so difficult to find *the* right partner.

[78] In the United States, for instance, there is no federal legislation requiring firms to offer paid holidays, and even less parental leave (see https://en.wikipedia.org/wiki/Parental_leave#America).

ety, praise money, but also because we do not look at children as *our* children, but rather as *their mothers'* children. That is precisely why the *instrumental* version of empowerment exists. Development agencies know that mothers are altruistic and that they are children's main care givers. Therefore, instead of trying to change men's mentality, "masculinity" definitions, and involving men in children's care, they support interventions that leave the unequal gender structure untouched.

It might thus be that major aid organisations want to promote female education just in order to reduce fertility,[79] but they do not seem to be interested in women's well-being in its own right. Otherwise, why are not bringing sex ratios down to their natural level of 104-106 boys born for every 100 girls born, and ending sex slavery at the top of their priorities?[80] The answer may lie in that setting balanced sex ratios and lowering "gender differentials in mortality" among the MDGs may compromise low fertility rates in India and China. It thus seems that, as long as fertility rates are kept low,[81] the "instrument" is irrelevant, even if that means that an increasing number of girls are sold as prostitutes in India (Hvistendahl (2011)).

Likewise, development agencies may argue that any education is empowering precisely because they see it as a means to reduce fertility rather than to prepare girls to "assess their worth and envisage new possibilities" (Stromquist (2002, 24)). Such preparation may be irrelevant given than *any* education keeps girls "busy", thus (presumably) preventing them from starting a family at a young

[79]The link between higher female education and lower fertility has been exposed, for instance, by Jejeebhoy (1995) and Osili and Long (2008).

[80]Note that although the UN's Global Initiative to Fight Human Trafficking (UN.GIFT) (see http://www.ungift.org) exists, the phenomenon it is trying to fight against is not at the top of the UN's priorities.

[81]Hvistendahl (2011) argues that population growth has been slowed in India, in part, by reducing the number of daughters.

age.[82] Nonetheless, education does not equate with "empowerment"; take for instance women in Saudi Arabia or Iran, who can be highly educated but still be, legally, seen as subordinate to men.

Similarly, note that *PROGRESA,* that aims at empowering women and is supported by the World Bank, which argues that any education is empowering, has thus chosen **not** to empower adult women. That is, I think that there would be no debate regarding the empowering effects of becoming literate. However, note that *PROGRESA* is not making a difference at that crucial stage as enrolment rates at primary school among girls were already close to 100 percent prior to the program (De Janvry and Sadoulet (2006)). This is precisely why several studies suggest suspending the scholarships at that school level, and saving the money for higher grades (Attanasio et al. (2005), De Janvry and Sadoulet (2006), Todd and Wolpin (2006)).

Moreover, the program has chosen not to offer basic education for illiterate adult women, even when the latter have repeatedly requested it (Adato et al. (2000)). This supports the hypothesis that the final goal of mainstream development agencies is, simply, to reduce fertility, and that they see female education just as an instrument to reach that goal. That is, as adult women have already started a family -that is why they are *PROGRESA* beneficiaries-, aid agencies / the state may find it useless for their final goal to teach them basic reading, writing and numeracy skills, even when that would give women better economic oppor-

[82]Some literature has shown the existance of a negative correlation between age at first birth and completed fertility (e.g. Kohler et al. (2001)). Nevertheless, note that the reason why some parents do not want their daughters to continue their education is often precisely because they fear, just as aid donors, that their daughters may start a family at a young age, after having found a boyfriend at school and getting pregnant (Adato et al. (2000)). Furthermore, there are reports of school teachers in sub-Saharan Africa using their status to sexually abuse girls (http://allafrica.com/stories/201307140017.html; http://www.soschildrensvillages.org.uk/about-our-charity/archive/2010/10/sex-crimes-against-children-in-uganda) which, anecdotal evidence shows, makes parents less willing to send their daughters to school.

tunities, and benefit their children in the long run. In contrast, *Oportunidades* provides education for young girls, starts paying higher bursaries for them precisely when they become biologically able to have children (i.e. at the onset of secondary education (normally age 12)), and aims at improving the health and nutrition of young children, all of which may help to reduce fertility.[83]

Nonetheless, the link between girls education and lower fertility sometimes fails, as teenagers often find a partner at school and become pregnant.[84] Is education thus 'truly' empowering girls? That is, is becoming pregnant their (free) choice? Otherwise, were not they aware of the risks of having unprotected sex? Did not they know that contraceptives exist? Did not they know where from to obtain them? Were not they **empowered** enough as to resist men's pressures or to insist on / impose the use of a prophylactic upon their partners? Or were they forced to have sex?[85] Could not we say that education has failed to empower these girls in the sense of preparing them to "assess their worth and envisage new possibilities" (Stromquist (2002, 24))?

Lastly, given that changing socially constructed definitions of masculinity takes time, applying / debating the application of the following policies may help to face human traffiking.

1. Punish the purchase of sex, just as it is done in Sweden.

2. Publicly expose users of child prostitution regardless of where the offence

[83]The positive association between child mortality and fertility (Chowdhury (1988), Palloni and Rafalimanana (1999)) may be due to people choosing to have more children than their ideal family size in contexts of high infant / child mortality, as to ensure that they end up with their ideal family size in the long-run.

[84]For instance, in a single upper secondary school (usually ages 15-18) in a Mexican municipality in the State of Mexico, 45 students became pregnant during the first two months of the academic year 2012-2013 (see http://www.zocalo.com.mx/seccion/articulo/son-embarazadas-45-alumnas-en-dos-meses)

[85]Again, note the reports of school teachers in sub-Saharan Africa using their status to sexually abuse girls (http://allafrica.com/stories/201307140017.html; http://www.soschildrensvillages.org.uk/about-our-charity/archive/2010/10/sex-crimes-against-children-in-uganda).

takes place. There could be, for instance, a dedicated webpage where any one could check the list of convicted paodophiles.

3. Offer support to paedophiles who request to be treated (they might come forward if they are certain that if they are catched they will be publicly exposed). Psychological and psychiatric support could, for instance, be made available; and groups of "Paedophiles Anonymous", similar to the existent "Alcoholics Anonymous", could be created.

4. Help to fight corruption in developing countries. Corruption makes human trafficking for sexual exploitation possible.[86]

1.5 Conclusions

This chapter has provided a background on women's empowerment. In particular, it has highlighted the existence of two notions of empowerment, each of them involving different underlying capacities and freedoms for women. One of them is the "instrumentalist" notion, which emphasizes women's altruism and dedication to the collective family welfare, and is thus not likely to be resisted within the household. The other one is the *selfish / self-interest* notion, which focuses much more on the conflictual element of gender relations. In this case, empowerment is put to the service of meeting women's own physical, emotional, and / or mental well-being.

This thesis contributes to the literature by providing empirical examples of how the two types of empowerment can affect children's welfare. The second chapter relates to the *instrumentalist* notion of empowerment, and the third chapter to the *selfish* one. Specifically, the second chapter evaluates a conditional cash transfer (CCT) program, which empowers poor women in Mexico by giving them tools

[86] See Cacho (2010).

to be better mothers, in terms of its impact on birthweight. The third chapter analyses whether empowered women, defined as those who have better control of their own healthcare and bodies, as well as more progressive gender attitudes, are more likely to have a firstborn girl in Delhi, India. This probability itself constitutes a women's empowerment achievement because, although it is a child outcome, it affects women's health and, in a context of 'missing' girls, it affects and is a by-product of gender power relations in society.

Given this setting, the first chapter provides a literature review on the evaluation of *PROGRESA-Oportunidades*, the CCT program, drawing attention to the importance of exploring its impact beyond simple mean effects. Such emphasis is due to the fact that Chapter 2 assesses the program's impact on the whole birthweight distribution rather than just at the mean. Additionally, Chapter 1 gives an overview of how women's empowerment/autonomy has been measured in the literature. The Chapter then questions the apparent success for which *Oportunidades* is internationally recognized by including critical appraisals of the program in general, as well as on its effect on women's status and empowerment / autonomy.

On the other hand, Chapter 1 reviews the indicators and methodology that has been used to measure women's empowerment in research that uses the same type of datasets employed in Chapter 3. This was necessary as the latter chapter first constructs an index of *selfish* empowerment, referred as *progressivity*, and then assesses its effect on the sex of the firstborn and on the duration to first birth in Delhi, India. Chapter 1 thus explains the importance of studying the first outcome in the context of women's empowerment, and the reasons for introducing the notion of *progressivity*; it also highlights the fact that the latter is analysed first as a dependent variable in Chapter 3, and describes the indicators and the

estimation methodology used to measure it.

Additionally, Chapter 1 presents a hypothesis to explain why there exist two so different, and even conflicting, notions of female empowerment. Finally, the chapter outlines some ideas that, if put into practice, may help to increase women's well-being (i.e. reduce their suffering).

In sum, this thesis contributes to the women's empowerment literature by providing an example where a seemingly empowering intervention leaves the unequal gender context unchallenged, or even reinforces it, even while apparently bringing about benefits for children. In this sense, the thesis exemplifies the potential trade-offs that may exist between women's own welfare and their children's well-being. On the other hand, the thesis presents an instance in which women's empowerment helps to reduce prevailing gender inequalities. In that case, the thesis highlights the importance of the gender context in enhancing or negating the effects of individual-level empowerment on well-being outcomes, and draws attention to the need of instilling progressive thoughts in communities of women, as well as in men.

Tables

Table 1.1: Monthly scholarships in US dollars†

School Grade	**Cash Transfer (US$)**	
Primary School	Males & Females	
3rd	13	
4th	15	
5th	19	
6th	25	
Lower Secondary School	Males	Females
7th	37	39
8th	39	43
9th	41	47
Upper Secondary School	Males	Females
10th	62	71
11th	67	76
12th	71	81

†Source: SEDESOL (2009). Scholarships for July-December 2012 paid in Mexican pesos; Mexico's Central Bank's official average exchange rate (13.06 pesos per US$) (www.banxico.org.mx) for that period was used to obtain the figures in dollars.

Table 1.2: Required health centre visits for program beneficiaries†

Who?	**How many?**	**When?**
Check-ups		
Children		
$<$ 4 months	3	At 7 and 28 days, and at 2 months
4-24 months	20	One per month
2-4 years old	3 per year	One every 4 months
5-9 years old	2 per year	One every 6 months
10-19 years old	2 per year	One every 6 months
Women		
Pregnant	**5**	**First one in first trimester**
Lactating	2	-
Adults (both genders)		
20-49 years old	2 per year	One every 6 months
50+ years old	1 per year	-
Health, hygiene, nutrition and best practices talks		
Mother of the family	**6 per year**	**One every 2 months**
Other adults	1 per year	One every 12 months

†Source: SEDESOL (2009). Requirements in bold are some of the channels through which *Oportunidades* might affect birthweight.

Table 1.3: Timetable for the evaluation of *Oportunidades*†

Date	**Survey**
Nov-1997	**1st interview (*ENCASEH*)**
	↓
Mar-1998	2nd interview (1st *ENCEL*)
	↓
May-1998	Treatment localities start receiving benefits
	↓
Oct-1998	2nd *ENCEL*
	↓
Jun-1999	3rd *ENCEL*
	↓
Sep-1999	Control localities start enrolling & **Transfers start to be recorded**
	↓
Nov-1999	4th *ENCEL*
	↓
Autumn-2003	**5th *ENCEL* & Fertility survey**
	↓
2004	New control localities start enrolling

†Source: INSP (2006). Surveys in bold were used in Chapter 2.

2 Chapter 2: A Poverty Alleviation Program and Birthweight

2.1 Introduction

Each year 15 percent of all newborns in developing countries -a total of 19 million babies- are born with low birthweight (<2.5 kg) (UNICEF(2010)). Compared to babies who were born with normal weight, low-birthweight babies face several disadvantages throughout their life. They have a much higher risk of dying within the first 28 days after birth (McIntire et al. (1999)), experience higher mortality and morbidity rates during childhood (Boardman et al. (2002)), have an increased risk of attention problems (e.g. Breslau and Bohnert (2008)), and lower adult productivity (see Behrman and Rosenzweig (2004)). The latter study also finds that increased birthweight increases adult height and adult educational attainment.

In developing countries, poor maternal nutrition during pregnancy (e.g. Fall et al. (2003)), anaemia (see Mavalankar et al. (1992) and Feresu et al. (2004)), infectious diseases such as malaria (see, for example, Verhoeff et al. (2001) and Feresu et al. (2004)), maternal smoking during pregnancy (e.g. Ferraz et al. (1990)), and inadequate or lack of prenatal care (see, for instance, Mavalankar et al. (1992), Coria-Soto et al. (1996) and Goldani et al. (2004)) have been found to directly or indirectly contribute to lower birthweight.

This chapter evaluates the Mexican conditional cash transfer program *Oportunidades* (opportunities) in terms of its impact on birthweight. Poor households

under the program receive cash upon their investment in their members' human capital. This means: children must regularly attend school; all household members must regularly visit health clinics to receive preventive healthcare; and adults have to attend talks on health, hygiene, nutrition, and in general best practices (SEDESOL (2009)).

Oportunidades may affect birthweight as it seeks to improve the nutrition of pregnant women, provide them with access to adequate prenatal care, and increase maternal awareness. Specifically, pregnant women in beneficiary households have to attend at least five prenatal care consultations, the first of which has to take place during the first trimester of pregnancy. They also receive nutritional supplements that provide them with 20 percent of their daily calorie requirements and 100 percent of all necessary micro-nutrients (Hoddinott and Skoufias (2004)). Moreover, the household's female head must attend bi-monthly talks on health, hygiene and nutrition, and it is she who receives the cash transfers.

Barber and Gertler (2008, 2010) analyse the effect of *Oportunidades* on mean birthweight and find that the latter is 127 grams higher for babies born into households that had already received its first cash transfer. Mean effects may however not be representative of the impact of covariates at the extreme tails of the *conditional* birthweight distribution (see, for instance, Abrevaya (2001), Koenker and Hallock (2001) and Abrevaya and Dahl (2008)), and in this case, we may be particularly interested in what happens at lower quantiles. Furthermore, *conditional* quantile regression estimates do not tell us what will happen to a particular baby when we change a covariate by a small amount, since the baby will not necessarily be on the same quantile after the change. For this, *unconditional quantile regressions* (Firpo et al. (2009)) are needed.

This chapter uses conditional and unconditional quantile regressions to assess

the effect of *Oportunidades* on the birthweight of babies born into enrolled households in rural Mexico. The results show that the program did have a positive impact on birthweight but that babies at the upper tail of the distribution have benefited the most in terms of weight gain. While *Oportunidades* is associated with a 206-gram increase on birthweights at the 80th percentile of the conditional distribution, the effect at the median is 155 grams, and 135 grams at the 20th percentile. Unconditional quantile regression estimates corroborate this pattern of the effect of the transfer at the different points of the distribution.

This heterogeneous program effect on birthweight may be due to heavier babies belonging to households with healthier members even in the absence of *Oportunidades*, such that when the program is introduced and the cash received it can be spent mostly on the pregnant woman, generating a higher positive impact on babies who would have been better off anyway.[87] The fixed (i.e. independent of household characteristics) component of the transfer, which is intended to buy food, should thus probably be higher for larger households, and for those whose members have on average a poor health status.

A second finding is that maternal smoking during pregnancy is associated with a 460-gram decrease in birthweights at the 20th percentile of the conditional distribution. This effect, which is not picked up by least squares regression estimates, more than completely wipes out any program benefits. Therefore, reminders about the dangers of smoking during pregnancy should be given repeatedly during prenatal care consultations and at the health and nutrition talks, both of which are compulsory for beneficiaries.

The remainder of the chapter is divided as follows. Section 2.2 describes the conditional cash transfer program. Section 2.3 presents the data, sample, and

[87] Note that unfortunately, there is no data available on objective measures of health, such as body mass index, that would allow controlling for the health status of all household members.

descriptive statistics. Section 2.4 outlines the model, and Section 2.5 presents the results. Section 2.6 undertakes robustness checks, and Section 2.7 deals with unconditional quantile estimation. Section 2.8 concludes.

2.2 The conditional cash transfer program

2.2.1 Conditionality

Oportunidades was introduced in 1997 under the name *Programa de Educacion, Salud y Alimentacion* (*PROGRESA* – Education, Health and Nutrition Program) to benefit more than 140,000 households in rural Mexico. It has expanded since its inception such that beneficiary families reached 5.8 million in 2012 (20 percent of all households in Mexico). Under the program, beneficiary households receive cash upon their investment in their household´s human capital. The total transfer consists of two parts, a fixed amount (i.e., common to all enrolled households), and an amount that varies across households depending on their demographic composition.

The fixed amount is conditional on all household members fulfilling their health centre-related obligations. This means that all members must attend their required check-ups and adults must regularly attend talks on health, hygiene and nutrition (see Table 1.2). What is relevant for birthweight is that pregnant women have to attend at least five prenatal care consultations, the first of which has to take place within the first trimester of pregnancy, and that the female household head must attend talks on best practices regarding hygiene, health, and nutrition every two months. Moreover, pregnant and lactating women, as well as newborns and malnourished children, are given nutritional supplements which contain 20

percent of their daily calorie requirements, and 100 percent of all necessary micro nutrients (Hoddinott and Skoufias (2004)).

If all household members fulfill their health centre-related obligations, the mother of the family receives a cash transfer in Mexican pesos which in the second semester of 2012 was equivalent to $34 per month (SEDESOL (2013)).[88] This grant is intended to buy food and, in December 2012, it was around 53 (38) percent of the cost of the basic food basket for a single person residing in a rural (urban) area.[89] The second part of the subsidy is conditioned on the regular attendance at school of all children in the household between the grades 3 to 12 (usually ages 8 to 18).[90] The grant increases as children progress through school and from the 7th grade onwards is higher for girls than for boys, but there is an upper limit for this scholarship component (SEDESOL (2013))[91].

The total transfer may thus differ across households and to receive it, all household members must fulfill their obligations over a two-month period. Schools and health centres are then given about one month deadline to submit attendance records to the program administrators. The latter then calculate the total payment that each household is entitled to, and transfer it to the female household head on a bi-monthly basis for initially three years, after that a reassessment takes

[88]Mexico's Central Bank's official average exchange rate for that period (13.06 pesos per dollar) was used to obtain the figures in US dollars (see http://www.banxico.org.mx/).

[89]The per capita value of such basket is provided every month by Mexico's National Council for the Evaluation of Social Development Policy (CONEVAL) (see http://www.coneval.gob.mx/), which is the institution that provides official poverty statistics in the country. The official average exchange rate for December 2012 (12.87 pesos per dollar), was used to obtain the value of both baskets, rural and urban, in US dollars (see http://www.banxico.org.mx/) and so, calculate the proportion that the fixed part of the household cash transfer may represent for a single person.

[90]Grants for children enrolled in school grades 1 and 2 are also available in villages with less than 2500 inhabitants.

[91]For the second semester of 2012, such cap was set at about 97 USD per month for families with children enrolled in primary and lower secondary school; and at 178 USD for families with children enrolled in upper secondary school (SEDESOL (2013)). Mexico's Central Bank's official average exchange rate for that period (13.06 pesos per dollar) was used to obtain the figures in US dollars (see http://www.banxico.org.mx/).

place (SEDESOL (2009)).

2.2.2 Selection of beneficiaries

In rural areas, the selection of beneficiaries into the program consists of three steps: 1) Identifying the localities to be targeted; 2) selecting households in those localities; and 3) having a community assembly approve the list of beneficiaries (INSP (2006)).

Localities are identified using a marginalization index that was previously constructed for each locality in Mexico for which socioeconomic and demographic census data existed. Localities with the highest marginalization indeces are given priority for inclusion in the program provided that they have access to educational and health centre infrastructure, and a minimum of 50 inhabitants. Given these conditions are met, a socioeconomic and demographic survey is administered to each household in the locality and a poverty index score generated for each of them (INSP (2006)). Eligible households are then identified using linear discriminant analysis but in general, households with poverty index scores above the median are deemed to be eligible. Nevertheless, the fact that the community has the final say on the list of beneficiaries has meant that some households which were deemed ineligible end up being enrolled.

2.2.3 Evaluation sample

Due to logistical and financial constraints the program was introduced in phases. At the program's inception, the Mexican government took advantage of this feature by randomly selecting 506 poor localities in seven states to participate in an *evaluation sample*. Out of them, 320 were randomly selected to start

receiving benefits from May 1998 (having started to enrol from March 1998). Residents of the remaining 186 localities then started to enrol in September 1999 and to receive benefits soon afterwards, but initially they did not know about this and thus constitute the original control group. While the randomization was successful at the locality level, the two groups of localities (i.e. early and delayed enrollers) were significantly different in terms of several household and individual variables (INSP (2006)).

The program evaluation consisted of periodically interviewing all households in the 506 localities between November 1997 and November 1999, and then again in 2003 (see Table 1.3). The first survey, the *Encuesta de Caracteristicas Socioeconomicas de los Hogares* (*ENCASEH* - Survey of Household Socioeconomic Characteristics), was used to select households into the program. Eligible households had to enrol by a deadline, after which no enrolment was permitted until three years later when the next selection process took place. This prevented migration into the original treatment (early-enrolled) localities to receive benefits. The program take-up rate among eligible households in the *evaluation sample* was 97 percent. Initial enrolment was for three years conditional on fulfilling the program's obligations; only about 1 percent of the households were denied program benefits due to non-compliance (Boyce and Gertler (2001)).

After enrolment, four rounds of an evaluation survey, the *Encuesta de Evaluacion de Hogares* (*ENCEL* - Household Evaluation Survey), were carried out between March 1998 and November 1999. A fifth *ENCEL* was administered in the autumn 2003 to assess the program's medium-term effects. As by then all 506 localities in the *evaluation sample* had already been incorporated into the program, a new control group was created by using socioeconomic and demographic data to match each of the 506 localities to a locality that had not yet been incor-

porated. However, as replacement was allowed, only 152 localities constitute the new control group (Todd (2004)).

Before 2003 each *ENCEL* consisted only of a socioeconomic survey. In 2003 however, a Fertility Survey was also administered to 14,861 women aged 15 to 49. The sample included a representative group from each of the three types of localities (original treatment, original control, and new control) in each of the seven states under evaluation (CONAPO (2004)). This database is my main source of data. It contains basic information such as the date of birth and gender of all children born alive during the intervention period (1997-2003), and detailed information on each woman's last pregnancy, including outcome and birthweight of the newborn.

2.3 Data, sample & descriptive statistics

2.3.1 Data & sample

This chapter uses data from five different sources. The Fertility Survey was used to obtain data on the outcome variable birthweight, on the date when each household enrolled in *Oportunidades*, and on infant, maternal, and pregnancy related variables. The *ENCASEH* was in turn used to obtain data on household characteristics prior to the intervention, and [92]locality level data was taken from the 2005 Population Count (short census). Lastly, the Transfers Database, which contains information on all transfers made to beneficiaries since September 1999, and the (socioeconomic) *ENCEL* 2003 were used to identify households that withdrew

[92]Note that no maternal controls at baseline (i.e., before the program's inception) were used. This is because apparently, the household member identifier was not always respected across different survey's rounds. I concluded this after merging the Fertility Survey with the *ENCASEH* and finding out that in some cases the month and year of birth, and sometimes even the gender, allegedly referring to the same person did not coincide.

from the program before 2004. All these datasets are publicly available at the program's website (www.*oportunidades*.gob.mx).

The sample includes 744 singleton live births which weighed less than seven kilograms, and took place in households where only one member gave birth (perhaps more than once) between 1997 and 2003. These households were designated as poor, enrolled in the program before 2000, have fully completed interviews, and included full information on all covariates. That is, the program effect will be captured using an indicator for whether or not the baby was born under the program (and thus, was a beneficiary birth).

As there is no publicly available data regarding the amount of cash transfers received by beneficiary households before September 1999, the sample was obtained assuming that no household withdrew from the program before that date. This assumption is supported by a mean exposure time before withdrawal for dropouts in the final sample (a total of 49 observations) of three and a half years. In any case, Section 2.6 shows that the results are robust to six beneficiary births, whose households may have withdrawn before September 1999 (they have mostly missing values in the Transfers Database but are not recorded as dropouts), being treated as non-beneficiaries instead.

Furthermore, note that 23 households that enrolled in *Oportunidades* before 2000 were excluded from the analysis as it was not possible to determine whether or not they dropped out from it; and if so, whether it was before or after the baby's birth. None of those households is included in the Transfers Database, 16 of them identified themselves as not receiving program cash benefits in the *ENCEL* 2003, and the remaining seven did not have information on this last question (three of them because of not being included in that *ENCEL* at all). Still, Section 2.6 shows that the results are robust to the inclusion of these 23 observations, which

results in a sample size of 767.

2.3.2 Descriptive statistics

Table 2.1 shows descriptive statistics (mean and standard deviation) of all variables used in the analysis separately by beneficiary status. Beneficiary babies have been defined as those being born at least 2 months after their household enrolled in *Oportunidades*. This ensures expectant mothers in beneficiary households to have had some program exposure in terms of prenatal care, nutritional suplements, and health and hygiene talks. Furthermore, the household might also have already received its first cash transfer two months after enrolment.

The results show that beneficiary births are 125 grams heavier than their non-beneficiary counterparts. In terms of maternal, infant, and pregnancy related characteristics, we see that the baby whose birthweight is being analysed is of higher order parity (higher than the third birth) in both subsamples. The proportion of girls among beneficiary births is higher than among non-beneficiary ones (47 versus 42 percent). This is probably due to the difference in sample sizes. Babies born at least two months after their household enrolled in *Oportunidades* were weighed on average 3 days after birth, compared to 4.2 days for non-beneficiary births. This may be due to babies in beneficiary households being born in health facilities rather than at home. Mothers were on average 30 years old in both subsamples, and the same proportion of women reported having smoked during preganancy (4 percent of them). Lastly, a prenatal care quality index was constructed based on three indicators: whether or not the prenatal check-ups were undertaken by a physician or a nurse, and whether or not they included weighing the expectant mother, and measuring her uterus. The results

show that the index is on average very similar for both birth groups, being 0.91 for non-beneficiary births and 0.94 for beneficiary ones.

Turning to household socioeconomic and demographic characteristics prior to the introduction of *Oportunidades* we see that, among beneficiary births, a larger proportion of household heads speak an indigenous language (34 versus 28 percent among non-beneficiary births). That variable will be included as a covariate as a proxy for ethnicity. Household heads among non-beneficiary births were on average slightly more educated than heads of households where beneficiary births took place (3.84 versus 3.5 years of formal education). The former were also slightly older than the latter in November 1997, when the first interview took place (34.8 versus 34.3 years old). On average, both groups were made of six members, one third of which were children younger than 6 years, and another third were children aged 6 to 17 years. Lastly, an *economic* index capturing dwelling characteristics and assets possession was created based on whether the dwelling has water and electricity, a fridge and a stove, its floor is covered, and whether the household owns agricultural land. The index could take values between 0 and 1, and its average was 0.3 for both beneficiary and non-beneficiary births.

Finally, the locality's altitude will be included as a covariate following previous research (see Giussani et al. (2001)) which has found that it is negatively associated with bithweight. The results in Table 2.1 show that localities where beneficiary births took place have on average very similar altitude than those where non-beneficiary births ocurred (1293 versus 1307 meters).

2.4 Model

This chapter uses linear conditional quantile functions (Koenker and Bassett (1978), Koenker (2005)) to investigate the impact of *Oportunidades* at different points of the birthweight distribution. Specifically, consider:

$$F^{-1}_{BW_i}(.) \equiv Q_{BW_i}(\theta|\mathbf{x_i}) = \mathbf{x_i}'\beta_\theta,\ \text{i} = 1, \ldots\ , \text{N};\ 0<\theta<1;\ \beta_\theta \,\epsilon\, \mathbb{R}^\rho$$

where:

BW_i = birthweight in grams, where the i's are independent of each other.

$F_{BW}(.)$ =BW's cumulative distribution function.

$\mathbf{x_i}$= Vector of independent variables

In this context, the θth regression quantile is defined as any solution $\beta^*_\theta \,\epsilon\, R^\rho$that solves:

$$\min_{\beta_\theta \epsilon \mathbb{R}^\rho} \sum^N_{i\epsilon(i:BW_i \geq x_i'\beta_\theta)} \theta|BW_i - x_i'\beta_\theta| + \sum^N_{i\epsilon(i:BW_i < x_i'\beta_\theta)} (1-\theta)|BW_i - x_i'\beta_\theta|$$

That is, just as classical least squares seeks to minimize the sum of the squared residuals, conditional quantile functions are estimated by minimizing an asymmetrically weighted sum of absolute residuals. A special case is the symmetric sum, which yields the median regression.

The *baseline* specification captures the program impact through a binary variable, b (*beneficiary*), indicating whether the recorded birthweight refers to a beneficiary (b=*1*) or a non-beneficiary birth (b=*0*). Furthermore, the vector of independent variables $\mathbf{x}$ is split into maternal, infant, and pregnancy related variables $\mathbf{m}$, household characteristics at baseline, $\mathbf{z}$, and locality characteristics, $\mathbf{y}$ (see Table A2.1 in the Appendix for details) as follows:

$$Q_{BW_i}(\theta|\mathbf{m_i},\mathbf{z_i},\mathbf{y_i}) = \alpha_\theta + \gamma_\theta b_{i,k} + \beta'_{\theta\mathbf{1}}\mathbf{m_i} + \beta'_{\theta\mathbf{2}}\mathbf{z_i} + \beta'_{\theta\mathbf{3}}\mathbf{y_i} + \varepsilon_i,\ \theta = 0.1,\ 0.2,\ ...,\ 0.9 \quad (2.1)$$

where:

$b_{i,k} = \begin{cases} 1 & \text{if born at least } k \text{ months after the household enrolled in } \textit{Oportunidades} \text{ and before the former withdrew from the latter} \\ 0 & \text{otherwise} \end{cases}$

$\mathbf{m}$ = Maternal, infant, and pregnancy related variables: Birth order, gender, and the number of days after birth when the baby was weighed, maternal age at birth, maternal smoking during pregnancy, and a prenatal care quality index.

$\mathbf{z}$ = Household characteristics at baseline: Household head characteristics: age, education, and whether he speaks an indigenous language. Family structure: household size, proportion of members younger than 6 years, and proportion of members aged 6 to 17 years. Dwelling infrastructure and assets possession index: the dwelling has water and electricity, a fridge and a stove, its floor is covered, and the household owns agricultural land.

$\mathbf{y}$ = Locality characteristics: Altitude.

In equation (2.1), k had to be chosen so as to generate groups of beneficiary and non-beneficiary births statistically indistinguishable from each other in terms of their observable characteristics prior to the intervention. Therefore, mean-comparison tests for each pre-birth covariate in equation (2.1) were carried out between the beneficiary and the non-beneficiary births generated by a minimum program exposure ranging from two to nine months (k = 2,...,9). That is, only values of $k \geq 2$ were considered as $k=0$, the enrolment date, generally means a zero program exposure; and $k=1$ might be a too short period for households to "digest" the program.

The results in Table 2.2 show that only a minimum program exposure of *two* months ($k=2$) generate groups of beneficiary (560 observations) and non-beneficiary births (184 observations) statistically indistinguishable from each other prior to the intervention at the 5 percent significance level. From here onwards,

k in equation (2.1) is thus fixed at two (k=2). Note that after two months of enrolment households may not yet have received their first cash transfer, as the program administrators may not yet have verified the fulfilment of obligations. However, as the 560 households where beneficiary births occurred have on average been enrolled in *Oportunidades* for 33 months, the beneficiary indicator will be capturing, among others, the program's monetary effect.

2.5 Estimation results

Figure 2.1 plots birthweight density functions separately for beneficiary and non-beneficiary births along with their respective means and the normal distribution. We see that some beneficiary babies were born weighing less than 1.8 kilograms, whereas there are no such babies among the non-beneficiary births. It might thus be that *Oportunidades* enabled such low-birthweight babies to be born. Furthermore, compared to the distribution for beneficiary births, the distribution for non-beneficiaries has a larger mass at lower quantiles until about 2.8 kilograms, where both distributions coincide. The opposite happens from that point until about 3.17 kilograms. *Oportunidades* may have enabled babies who would otherwise have weighed less than 2.8 kilograms to be born with higher weight. Given that the birthweight mean for the beneficiary and the non-beneficiary births is very similar, 3279.3 and 3154.2 respectively, these hypotheses cannot be tested using OLS. In contrast, quantile regressions are very suitable in this context.

Figure 2.2 plots the effects of *Oportunidades* (first panel) and maternal smoking (second panel) on birthweight obtained from estimating equation (2.1) using both conditional quantile regressions (at $\theta = 0.1, ..., 0.9$), and ordinary least

squares. The respective 95 percent confidence intervals are also shown.[93] From the first panel, it is apparent that the program effect (*beneficiary*) does vary along the conditional birthweight distribution, although the associated standard errors are very large. The second panel illustrates that maternal smoking during pregnancy (*smoked*) has a large and negative effect on birthweights at the lower end of the conditional distribution. For birthweights below or at the 0.3 quantile, this effect lies outside the 95 percent confidence interval of the mean regression.

Table 2.3 reports full regression results for the baseline specification (k=2) for three conditional quantile functions (at $\theta = 0.2, 0.5, 0.8$) and the respective mean (OLS) effects. As Figure 2.2 illustrates, the program effect at median birthweights is very similar to the mean effect, at about 155 grams *ceteris paribus* and significant at the one percent level. In contrast, the program is associated with a 135- and a 207-gram increase on birthweights at the 20th and 80th percentile of the conditional distribution, respectively.

One possible explanation why babies at the top end of the conditional birthweight distribution may benefit more from the program is as follows. If in the absence of *Oportunidades* a newborn's weight is, all things equal, a proxy for the general wellbeing of her household, then heavier babies belong to households with better off, healthier members, such that when *Oportunidades* is introduced and the cash transfer received, it can be spent mostly on the pregnant woman, generating a higher positive impact on already better off babies; that is, on those at the upper tail of the conditional birthweight distribution. This result has economic significance even though the estimated program impacts at various quantiles may not be statistically different from each other due to their large standard errors.

[93]The confidence intervals for the quantile regression coefficients were estimated using bootstrapped standard errors (SEs) as Stata calculates the default SEs based on iid error assumptions. This is done using the method suggested by Koenker and Bassett (1978, 1982) and Rogers (1992) has found that those SEs are understated in cases of heteroskedastic errors.

The analysis in Section 2.6.3 will thus seek to decrease those standard errors by increasing the number of non-beneficiary births, as well as using heteroskedasticity consistent standard errors.

Table 2.3 also shows that babies at the 20th percentile of the conditional birthweight distribution born to women who smoked during pregnancy weigh 459 grams less than similar babies born to non-smoking mothers. This effect is not picked up by least-squares regression estimates.

Other results from the conditional quantile regressions that are not reflected in the mean estimates are as follows. Babies at the 20th percentile of the conditional birthweight distribution born to women who received high-quality prenatal care (i.e. the check-ups were undertaken by a physician or a nurse and included weighing the mother and measuring her uterus) are 308 grams heavier than babies born to women who received prenatal care, but lacked all of the above mentioned characteristics.

Likewise, a one-standard deviation (0.214) increase in the proportion of household members aged 6 to 17 years is associated with a 147-gram increase on birthweights at the 80th percentile of the conditional distribution. This effect may be due to the social customs in rural Mexico, where children -especially girls- are expected to take care of their younger siblings and help with the housework from an early age. In such a set-up more children aged 6 to 17 in a household would thus mean that, *ceteris paribus*, a pregnant woman has more time to rest and is less stressed, and therefore gives birth to healthier, heavier babies. The effect may be significant only at upper quantiles because, if a newborn's weight is a proxy for her household's general wellbeing, households that -even in the absence of *Oportunidades*- produce heavier babies, may also have older children who are healthy enough to actually take care of the youngest, help with the housework,

or at least do not demand too much attention.

2.6 Robustness checks

2.6.1 Baseline model

Figure 2.3 and Table 2.4 report robustness checks for the baseline model. Figure 2.3 plots the program effects obtained from estimating equation (2.1) after increasing the minimum number of months of program exposure; that is, using k=3,...,9. This was done as it may be interesting to know what happens if the beneficiary births were defined as only those that spent the whole pregnancy under the program (k=8, 9).

On the other hand, the results in Table 2.4 were obtained by re-estimating equation (2.1) after altering the baseline sample (reported under Sample (1)) as follows: (2) including 16 births out of the 23 that had been excluded from the analysis due to not appearing in the Transfers Database, and either not being beneficiaries in 2003, or not having information on their beneficiary status in that year (see Section 2.3), as non-beneficiaries; (3) same as (2), but switching the six births believed to be dropouts (see Section 2.3) into the non-beneficiary group; (4) defining the beneficiary status at birth exclusively on the basis of enrolment[94]; (5) adding to the baseline sample 61 births from households in which more than one member gave birth between 1997 and 2003.

Figure 2.3 plots the program effect obtained from estimating equation (2.1) by

[94]Note that in this case the mean-comparison-test yielded that three months (k=3) was the minimum program exposure that generated the most statistically similar beneficiary and non-beneficiary births at the 5 percent significance level. Therefore, equation (2.1) was estimated using k=3 in this case.

OLS (solid curve) and conditional quantile regressions at $\theta = .2$, .5, and .8 (curves with squares, triangles, and crosses, respectively), using k=3,...,9. The pattern of the baseline results holds along the whole range of k. The largest program effect is found at the 80th percentile of the conditional birthweight distribution, the smallest at the 20th percentile, and note that the effect at the latter percentile is not statistically significant for $k \geqslant 5$. Also, recall that the groups of beneficiary and non-beneficiary births generated by values of k>2 were found to be statistically different from each other already before treatment (see Table 2.2).

Table 2.4 shows that the baseline results are robust to the inclusion of most of the 23 births which had been left out of the analysis because of being missing in the Transfers Database, and either not being beneficiaries in 2003 or not having information on their beneficiary status in that year (see Section 2.3). I ignore why those and other households (a total of 135 in the 767 sample) are not included in that dataset. It could be that they left the program before September 1999, when the transfers began to be systematically recorded. If so, there would be no reason for concern if withdrawal was random. This may be the case if they dropped out because "[the program] *administrators failed to turn in paper work or instructions to beneficiaries in a timely manner*" (Alvarez et al. (2008, 646)), or any other administrative reason that made them unable to prove that they had fulfilled their program obligations. Nonetheless, it might also be that the withdrawal was due to some households' characteristics that also affect birthweight.

Because of this, sample (2) in Table 2.4 includes as non-beneficiaries 16 births, out of the relevant 23, that occurred after May 2000. This cutoff date was chosen such that even if the household withdrew from *Oportunidades* short before September 1999, there would be no program exposure whatsoever during pregnancy. Likewise, sample (3) differs from sample (2) in that it switches the six

births believed to be dropouts, due to having mostly missing values in the Transfers Database (see Section 2.3.1), into the non-beneficiary group.

The results obtained using samples (2) and (3) are in line with the baseline results in that the largest effect is found at the upper tail of the conditional birthweight distribution. Still, these samples are relevant only if omission from the Transfers Database means having dropped out of *Oportunidades*. However, the latter may not be the case as 109 households out of the 135 that are missing in the Transfers Database, identified themselves as beneficiaries in the *ENCEL* 2003.[95] Moreover, note that in those samples the resulting groups of beneficiary and non-beneficiary births are already statistically different from each other prior to the intervention. Specifically, the null hypothesis of equality of means for the indigenous variable is rejected with a p-value of 0.03 and 0.02 in samples (2) and (3), respectively. This is because most of the added observations in (2) and most of the switching observations in (3) are non-indigenous.

In sample (4) the beneficiary status at birth is defined exclusively on the basis of enrolment. This means that all the 23 observations that had been left out of the analysis in the baseline sample are now included as beneficiaries, yielding a total sample of 767. In this case, Table 2.4 shows that the pattern of the estimated coefficients is in line with those obtained using the baseline sample

[95]That is, starting with the larger sample of 767 observations, all of which enrolled in *Oportunidades* before 2000, there were 135 births with no information in the Transfers Database. Out of them, 111 occurred at least two months after enrolling in the program, so they should in principle be treated as beneficiary births; and the rest, 24, were non-beneficiary births. Nevertheless, out of the 111, 23 either identified themselves as non-beneficiaries in the *ENCEL* 2003, or did not have information regarding their beneficiary status in that year. As it was not possible to know when exactly they withdraw, they were excluded from the analysis. The baseline sample is thus 744 (767-23). On the other hand, out of the 109 that identified themselves as beneficiaries in 2003, 88 were beneficiary births (the ones that were left after dropping out the 23 as explained above, i.e., 111-23=88), and the rest, 21, were non-beneficiary births. Lastly, the remaining 3 out of the 24 non-beneficiary births that were missing in the Transfers Database, identified themselves as non-beneneficiaries in 2003; but this is not important (i.e. there is no reason to exclude them from the analysis) as they were already non-beneficiary births.

of 744 observations (sample (1)), although the point estimates are much lower. This may be due precisely to treating as beneficiaries births which may not have occurred under the program.

Lastly, sample (5) adds to the baseline sample 61 births (46 beneficiaries and 15 non-beneficiary ones) from households in which more than one member gave birth between 1997 and 2003. The general patterns still hold, although the program point estimate (*beneficiary*) is in general lower than in the baseline sample. This may be due to the fact that a new birth translates itself into scarcer monetary resources within a household, as no extra cash transfer is received due to it. Moreover, given the structure of the Fertility Database, having birthweight information on more than one infant per household necessarily means that they are not siblings, so that the conflict over scarcer monetary resources may be exacerbated. The fact that the interaction between the beneficiary indicator and the indicator of households with more than one birthweight is always negative is consistent with these hypotheses. The rest of the analysis thus uses the baseline sample of 744 observations.

2.6.2 An alternative measure for the program's impact

The beneficiary indicator (b_i) in equation (2.1) does not control for the length of program exposure before birth. However, a longer exposure to *Oportunidades* may yield a larger positive effect on birthweight as mothers will presumably have been fed more nutritiously for longer before giving birth. On the other hand, women who were already pregnant when their household enrolled in *Oportunidades* may not have had five prenatal care visits as required and/or the first visit may not

have taken place within the first pregnancy trimester. Lastly, the more health talks a woman attends, the more likely she is to internalize the recommendations she receives there.

To test the hypothesis that a longer program exposure yields a larger positive effect on birthweight, b_i in equation (2.1) was replaced by the number of months between program enrolment and the date of birth for beneficiary births. Table 2.5 summarizes the effects of *Oportunidades* (first panel, second row) and maternal smoking (second panel, second row) for this specification (for full results see Table A2.6 in the Appendix). The program effects and their respective standard errors were obtained by multiplying the marginal (per month) effects by the average number of program months for beneficiary births (33 months).

The results show that babies at the 80th percentile of the conditional birthweight distribution born into households that had been enrolled in *Oportunidades* for 33 months weigh, *ceteris paribus*, 121.2 grams more than similar babies born into households that had not yet enrolled. In contrast, the program does not significantly affect median birthweights and its effect at the lower quantile continues to be modest. Moreover, the standard errors associated with the program effects are still very large. On the other hand, maternal smoking during pregnancy is now associated with a 465-gram decrease on birthweights at the 20th percentile of the conditional distribution.

A sensitivity analysis for this specification using k=3,...,9 (not included) yields that the overall results hold along the whole range of k. There is no significant program effect at median birthweights and the effect at the 80th percentile of the conditional distribution is significant at the 5 percent level. Moreover, the effect at the 20th percentile is not significant for $k \geqslant 8$.

2.6.3 Decreasing the variance

In order to improve the precision of the estimated program impacts the sample size was increased by matching each of the 506 beneficiary births to its nearest-neighbour from a pool of 406 potential matches with complete data from the new control localities. As the number of potential matches was less than the total number of beneficiary births, replacement was allowed. The matches were then added as non-beneficiary births.

More specifically, propensity score matching was performed using all variables in vectors $\mathbf{z}$ and $\mathbf{y}$ in equation (2.1) and a logistic model. This procedure yielded only 184 matches due to the individuals from the new control localities having on average lower propensity scores. Moreover, it was not possible to use all matches, as doing so produced a zero probability of incorrectly rejecting the null hypothesis of equality of means between the resulting beneficiary and non-beneficiary births for several variables. Therefore, only 41 matches, the ones with predicted probabilities larger than 0.7, were included in the sample as non-beneficiary births. Mean-comparison tests between the beneficiary and the non-beneficiary births after matching yielded that the two groups are not statistically different in terms of all exogenous variables in equation (2.1) at the 5 percent significance level.

Table 2.5 summarizes the main post-matching results under "Model / sample (3)" (see full results in Table A2.7 in the Appendix). *Oportunidades* (first panel, third row) is now associated with a 120-gram increase in birthweights at the median of the conditional distribution at the 5 percent significance level. There is no significant program effect at the lower tail of the conditional birthweight distribution and, similar to the pre-matching situation, the largest effect (184 grams) is found on birthweights at the 80th percentile. Nevertheless, although

the standard errors of the estimated beneficiary coefficients after matching (first panel, third row) have decreased slightly compared to the baseline model (first panel, first row), they continue to be quite large such that the program effect might not be statistically different across quantiles. On the other hand, maternal smoking during pregnancy (second panel, third row) is associated with a 543-gram decrease in birthweights at the 20th percentile of the conditional distribution.

As a last attempt to reduce the standard errors of the program impacts, the baseline specification was estimated using conditional quantile treatment effects (CQTE) (Frölich and Melly (2010)). The main results from this model are shown in Table 2.5 under "Model / sample (4)" (for full results see Table A2.8 in the Appendix). As the treatment (being a *beneficiary* birth) is exogenous conditional on the control variables in vectors $\mathbf{m}$, $\mathbf{z}$ and $\mathbf{y}$ in equation (2.1), the point estimates were calculated using the Koenker and Bassett Jr. (1978) estimator, which is the one used in the classical linear conditional quantile regression. The standard erors however were obtained using the kernel estimator proposed by Powell (1986). This estimator is consistent in the presence of heteroskedasticity, unlike the estimator of the variance in the baseline model (first panel, first row). We see that the heteroskedasticity consistent standard errors of the estimated program impacts are smaller than the baseline ones at the extreme tails of the conditional birthweight distribution, but larger at the median. However, they continue to be extremely large such that the estimated program effects are again not statistically different across quantiles. On the other hand, the effect of maternal smoking during pregnancy (second panel, fourth row) on birthweights at the 20th percentile of the conditional distribution is now statistically significant at the 5 percent level.

2.7 Unconditional quantile estimation

This chapter has used quantile regressions to uncover the heterogenous effect of *Oportunidades* and maternal smoking at different points of the *conditional* birthweight distribution. *Conditional* quantile regression estimates however cannot tell what will happen to a particular baby when a covariate changes by a small amount as the baby will not necessarily be on the same quantile after the change. One may thus be interested in changes in the quantiles, q_θ, of the marginal (*unconditional*) birthweight distribution $F_{BW}(bw)$. That is, we may want to estimate the direct effect $dq_\theta(p)/dp$ of increasing the proportion of beneficiary births, $p = \Pr[b = 1]$, on the θth quantile of the birthweight distribution, where $b = 1$ if the birth is a beneficiary one, and $b = 0$ otherwise. Nevertheless, the coefficient $\beta_\theta = F^{-1}_{BW_i}(\theta|b = 1) - F^{-1}_{BW_i}(\theta|b = 0)$ from a single conditional quantile regression is generally different (the exception is the mean) from $dq_\theta(p)/dp = (\Pr[BW > q_\theta|b = 1] - \Pr[BW > q_\theta|b = 0])/f_{BW}(q_\theta)$, the effect of increasing the proportion of beneficiary births on the θth quantile of the unconditional birthweight distribution;[96] where $f_{BW}(.)$ is the density function of the unconditional birthweight distribution.

Because of this, Firpo et. al (2009) developed the unconditional quantile regression (UQR) approach to estimate the impact of changing the distribution of explanatory variables, $\mathbf{x}$, on the quantiles of the marginal (unconditional) birthweight distribution. The method, also known as *recentered influence function* (*RIF*) *regressions*, consists of running a regression of a transformation of BW on the explanatory variables. The transformation is the (recentered) influence function, which in this case represents the influence of an individual observation on a

[96]The expression for $dq_\theta(p)/dp$ is obtained by implicit differentiation of $F_{BW}(q_\theta) = p * (\Pr[BW \leq q_\theta|b = 1] - \Pr[BW \leq q_\theta|b = 0]) + \Pr[BW \leq q_\theta|b = 0]$ (Firpo et. al (2009)).

given quantile.

Specifically, given the outcome variable birthweight, BW, and a population θ-quantile, q_θ, of the unconditional birthweight distribution, the influence function, $IF(\centerdot)$, is given by:

$$IF(BW; q_\theta) = \theta - 1\{BW \leq q_\theta\} / f_{BW}(q_\theta)$$

where:

$1\{.\}$ =Indicator function specifying whether the birthweight value is below q_θ.

Adding back the distributional statistic of interest, q_θ, yields the *recentered influence function:*

$$RIF(BW; q_\theta) = q_\theta + \theta - 1\{BW \leq q_\theta\} / f_{BW}(q_\theta)$$

The *RIF-regression model* (Firpo et al. (2009)) is then defined as the conditional expectation:

$$E[RIF(BW; q_\theta)|\mathbf{x}]$$

where: $\mathbf{x}$ = All variables in vectors $\mathbf{m}$, $\mathbf{z}$ and $\mathbf{y}$ in equation (2.1).

The estimated coefficients, $E\left\{\frac{dE[RIF(BW,q_\theta)|X=x]}{dx}\right\}$, are the average marginal effects or *unconditional quantile partial effects* (Firpo et al. (2009)).

Figure 2.4 plots the estimated coefficients for the beneficiary indicator obtained from estimating equation (2.1) using the baseline sample and ordinary least squares (horizontal line with triangles), conditional quantile regressions (curve with squares), and OLS-*RIF-regressions* (curve with diamonds) for $\theta = 0.1, ..., 0.9$.

The latter used an Epanechnikov kernel function and the default "optimal" bandwidth calculated by Stata.[97] The main estimated coefficients are also shown in Table 2.5 (first panel, fifth row); full results are shown in Table A2.9 in the Appendix. The results are robust to alternative bandwidths and kernel functions.

Both Figure 2.4 and Table 2.5 (first panel, fifth row) show that the program effect on the unconditional quantiles of the birthweight distribution is similar to the effect on the respective conditional quantiles (first panel, first row in Table 2.5). This is due to the large standard errors that the estimated beneficiary coefficient displays and reflects the fact that a large amount of the birthweight variation remains unexplained. *Oportunidades* is thus associated with approximately a 140-gram increase on birthweights at the 20th percentile of the conditional and unconditional distributions. The respective program effects on birthweights at the other quantiles under investigation differ more across both distributions. Like this, although the effect of *Oportunidades* is increasing along the unconditional birthweight distribution, the program point estimates are less spread out than the ones on the conditional birthweight distribution.

2.8 Conclusions

Using quantile regressions this chapter has shown that the effect of *Oportunidades* on birthweight varies across the conditional distribution. While the point estimate on median birthweights is 155 grams, a lower, 135 grams, and statistically less

[97] Such "optimal" bandwidth (115 in this case) is not optimal in any global sense. It is simply the width that would minimize the mean integrated squared error if the data were Gaussian and a Gaussian kernel were used. For multimodal or highly skewed densities, this width is usually too wide and over smooths the density. Because of this, alternative bandwidths and kernel functions were used to check for robustness of the results.

significant program effect has been found on birthweights at the 20th percentile of the conditional distribution. In contrast, *Oportunidades* is associated with a 206-gram increase in birthweights at the 80th percentile of the conditional distribution. This result has economic significance even though the above mentioned effects may not be statistically different from each other as their associated standard errors are very large.

The use of conditional quantile regressions has also uncovered the fact that maternal smoking during pregnancy has a large and deleterious effect on birthweights at lower quantiles. Specifically, maternal smoking is associated with a 459-gram decrease in birthweights at the 20th percentile of the conditional distribution. This effect is not picked up by least square regression estimates.

Finally, this chapter used *recentered influence function regressions* (Firpo et al. (2009)) to estimate the effect of *Oportunidades* on various quantiles of the unconditional birthweight distribution. Those estimates are similar to the ones obtained through conditional quantile regressions and imply that already better off babies (those at the top of the birthweight distribution) have benefited the most from *Oportunidades*.

Empowering women by giving them access to adecuate prenatal care and improving their nutrition while pregnant, as well as by giving them greater control over resources and providing them with information on better practices thus seem to have a positive impact on babies' birthweight. Nevertheless, in order for newborns to fully reap the program's benefits, the latter may need to be modified to further empower women as follows: (i) Reminders about the dangers of smoking and the importance of healthy eating during pregnancy should be given repeatedly during prenatal consultations and at the health and nutrition talks, both of which are compulsory for beneficiaries. (ii) Awareness about the dangers of smok-

ing among non-beneficiaries could be raised using media campaigns, especially through posters, billboards and radio. (iii) The heterogeneous program effect on birthweight may be due to heavier babies belonging to households with healthier members even in the absence of *Oportunidades*. Therefore, the fixed (i.e. independent of household characteristics) component of the transfer, which is intended to buy food, should probably depend on household size and on the average health status of all household members.

Tables & Figures

Table 2.1: Sample means (standard deviation) by beneficiary status†

	Non-beneficiaries	Beneficiaries
Dependent variable		
Birthweight	3154	3279
	(573)	(641)
Maternal, infant, and pregnancy related characteristics		
Birth order	3.41	3.43
	(0.95)	(0.91)
Female	0.42	0.47
Days after birth when baby weighted	4.15	2.94
	(10.00)	(8.21)
Maternal age	29.79	30.20
	(6.10)	(6.23)
Mother smoked during pregnancy	0.04	0.04
Prenatal care's quality index (0-1)	0.91	0.94
	(0.24)	(0.17)
Household (hh) socieconomic & demographic characteristics at baseline		
Head of hh speaks indigenous language	0.28	0.34
Head of hh's education (years)	3.84	3.51
	(2.73)	(2.56)
Head of household's age	34.76	34.29
	(9.71)	(11.01)
Household size	6.05	5.89
	(2.08)	(2.28)
Children aged 0-5 in hh (proportion)	0.31	0.30
Children aged 6-17 in hh (proportion)	0.29	0.27
Economic index (0-1)	0.30	0.29
	(0.22)	(0.22)
Locality Characteristics		
Altitude (meters)	1307	1293
	(838)	(814)
N	184	560

†Beneficiary births are those which took place in households at least 2 months after the latter enrolled in *Oportunidades*, as by then the household might already have received their first cash transfer.

Table 2.2: P-values for the differences of means between beneficiary and non-beneficiary births given different minimum durations of program exposure (k)†

Min. exposure (months) = k	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Birth order	0.42	0.50	0.66	0.81	0.58	0.36	0.57
Maternal age at birth	0.43	0.47	0.58	0.69	0.98	0.94	1.00
Mother smoked while pregnant	0.89	0.97	0.93	0.76	0.63	0.53	0.42
Prenatal care quality index (0-1)	0.16	0.17	0.18	0.25	0.17	0.13	0.21
HoHH speaks indigenous lang.	0.10	**0.05**	**0.04**	**0.03**	**0.03**	**0.02**	**0.01**
Head of HH's education (years)	0.15	0.17	0.15	0.39	0.44	0.28	0.29
Head of HH's age	0.58	0.51	0.53	0.23	0.14	0.20	0.17
Household size	0.39	0.27	0.22	0.06	**0.02**	**0.02**	0.06
Children aged 0-5 in HH (0-1)	0.45	0.71	0.88	0.95	0.83	0.93	0.74
Children aged 6-17 in HH (0-1)	0.22	0.10	0.06	**0.03**	**0.01**	**0.02**	**0.03**
Economic index (0-1)	0.65	0.31	0.28	0.26	0.21	0.42	0.49
Altitude (meters)	0.84	0.75	0.75	0.70	0.67	0.64	0.53
Total sample size††	744	744	745	745	745	745	747
Non-beneficiary births	184	190	197	210	220	229	240
Beneficiary births	560	554	548	535	525	516	507

†P- values are for the test: $H_0 : \mu_0 - \mu_1 = 0$ *v* $H_1 : \mu_0 - \mu_1 \neq 0$, where the subindex of μtakes the value of 0 if it is a non-beneficiary birth, and 1 if it is a beneficiary birth. Unequal variances were assumed. P-values in bold are for the 5 percent significance level. HoHH stands for the head of the household. Source: Own computation using data from *ENCASEH*, Fertility Survey, *ENCEL* 2003, and Transfers Database. ††The sample size increases with k because, as the number of beneficiary births decreases with k, fewer people are prone to be excluded from the analysis due to being missing in the Transfers Database, and either identifying themselves as non-beneficiaries in the *ENCEL* 2003 or not appearing in that dataset.

Table 2.3: Baseline results for birthweight (equation (2.1), with k=2)†

Quantiles:	20%	50%	80%	OLS
beneficiary	135.2*	155.0***	206.5**	157.2***
	(77.00)	(54.52)	(83.01)	(50.61)
firstbir	-8.616	-142.3	-204.2	-157.4
	(146.7)	(126.0)	(129.4)	(103.8)
second	-125.9	-142	0.552	-114
	(114.0)	(115.1)	(138.0)	(87.25)
third	-81.69	-56.38	77.7	-44.33
	(101.3)	(80.51)	(110.5)	(74.87)
female	-182.4***	-191.3***	-190.9***	-168.3***
	(62.83)	(53.35)	(72.04)	(45.40)
daysafwe	5.886	5.358**	5.787	6.114**
	(3.660)	(2.315)	(3.916)	(2.674)
young	-88.65	-198.6*	-355.2**	-250.1**
	(218.1)	(111.8)	(139.6)	(115.6)
old	-34.65	11.13	-16.00	44.31
	(83.36)	(69.03)	(98.45)	(59.93)
smoked	-458.7*	69.35	77.59	-9.786
	(276.4)	(181.2)	(191.2)	(149.5)
qualindex	308.3**	124.9	36.96	80.98
	(154.8)	(146.2)	(221.5)	(133.5)
indig	-123.7	-149.7**	-113.3	-144.2**
	(94.95)	(67.16)	(83.83)	(62.19)
edu6head	-179.1*	-48.45	-51.44	-110.0*
	(92.19)	(62.88)	(91.43)	(60.53)
edplushead	-12.91	61.49	110.3	1.338
	(82.19)	(73.98)	(112.6)	(68.65)
agehead	2.898	3.438	3.467	3.551
	(4.142)	(3.712)	(3.844)	(2.668)
famsize	-6.507	-13.73	-36.90**	-23.29*
	(23.11)	(15.39)	(18.23)	(12.84)
propage5	209.4	22.31	156.3	109.1
	(351.8)	(329.2)	(400.0)	(293.9)
prage6_17	186.5	402.1	688.8*	326.3
	(317.4)	(287.7)	(351.6)	(247.6)
econindex	-58.61	-132.3	-263.6	-125.3
	(173.1)	(152.6)	(172.2)	(112.4)
altitude	0.000779	-0.0582	-0.0297	-0.0248
	(0.0453)	(0.0405)	(0.0435)	(0.0354)
Constant	2510***	3129***	3581***	3207***
	(295.8)	(269.2)	(413.5)	(258.3)

†N=744 in each case. SEs in parentheses (robust for OLS, bootstrapped (1000 replications) for quantile regressions). Significance level: * p<0.1, ** p<0.05, *** p<0.01.

Table 2.4: Robustness checks for the baseline sample

Variable	Quantile Regressions			OLS	N	Bene	Non-
(Sample†)	20%	50%	80%		All	ficiary	benef
Beneficiary							
(1)	135.2*	155.0***	206.5**	157.2***	744	560	184
	(77.00)	(54.52)	(83.01)	(50.61)			
(2)	144.3**	137.4***	201.0***	153.3***	760	560	200
	(73.44)	(51.41)	(72.16)	(48.27)			
(3)	141.0**	136.2**	201.1***	155.6***	760	554	206
	(70.19)	(54.23)	(71.68)	(48.00)			
(4)	79.49	114.1**	151.3*	109.0**	767	597	170
	(76.80)	(51.71)	(83.21)	(51.16)			
(5)	102.6	163.7***	184.0**	161.9***	805	606	199
	(73.26)	(50.00)	(81.07)	(50.41)			
Smoked							
(1)	-458.7*	69.35	77.59	-9.786			
	(276.4)	(181.2)	(191.2)	(149.5)			
(2)	-484.4*	67.06	78.47	-11.56			
	(278.8)	(163.8)	(191.6)	(144.6)			
(3)	-477.1*	101.7	79.97	-13.25			
	(286.0)	(161.0)	(167.9)	(144.6)			
(4)	-555.8*	22.19	70.77	-13.19			
	(297.3)	(156.8)	(181.7)	(144.9)			
(5)	-556.4**	140.1	34.31	-46.35			
	(277.5)	(168.3)	(148.3)	(143.3)			
Constant							
(1)	2510***	3129***	3581***	3207***			
	(295.8)	(269.2)	(413.5)	(258.3)			
(2)	2620***	3031***	3582***	3190***			
	(284.2)	(262.1)	(394.1)	(249.6)			
(3)	2627***	3031***	3597***	3191***			
	(301.9)	(262.3)	(385.7)	(249.6)			
(4)	2438***	3016***	3658***	3207***			
	(300.7)	(251.1)	(410.3)	(248.7)			
(5)	2406***	3076***	3564***	3154***			
	(306.0)	(258.0)	(368.3)	(246.0)			
Extra constant for households (*hh2*) with more than one birthweight							
(5)	-107.4	-107.5	-166.8	-189.6			

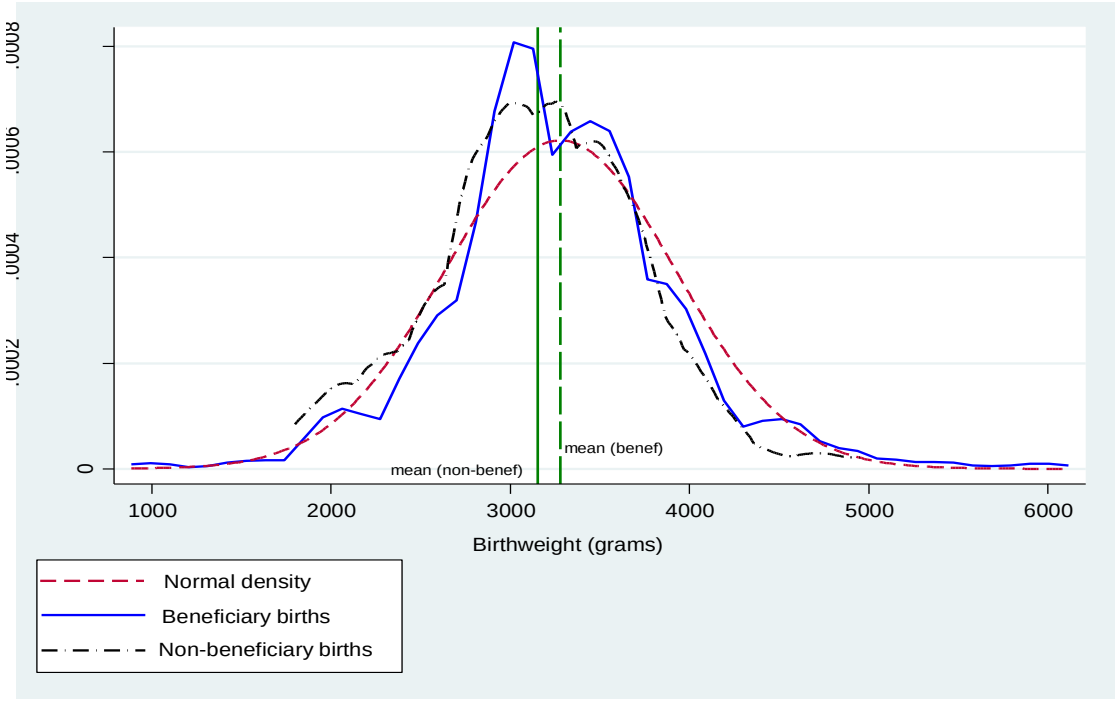
†(1) baseline; (2) adds as non-beneficiaries 16 births that occurred after May 2000 & are missing in the Transfers Database (TD); (3) as (2) plus switches the status of 6 observations that have mostly missing values in the TD; (4) the beneficiary status is defined on the basis of enrolment; (5) includes households with birthweight information on more than one member. The extra constant is for the sum of the coefficients on *beneficiary*hh2+hh2*. Standard errors in parentheses (robust for OLS, bootstrapped (1000 reps.) for quantile regressions). * p<0.1, ** p<0.05, *** p<0.01.

Table 2.5: Main results for different models/samples (k=2)†

Variable	Model / Sample	Quantile Regressions 20%	50%	80%	OLS
I. Program impact					
	(1)	135.2*	155.0***	206.5**	157.2***
		(77.00)	(54.52)	(83.01)	(50.61)
	(2)	81.99*	57.04	121.19**	85.56**
		(45.81)	(42.90)	(51.19)	(33.81)
	(3)	109.8	120.2**	184.3**	120.4**
		(71.38)	(47.92)	(71.97)	(46.85)
	(4)	135.2**	155.0**	206.5***	157.2***
		(66.52)	(63.22)	(68.27)	(50.61)
	(5)	141.5*	141.6**	174.4**	157.2***
		(74.26)	(67.38)	(75.80)	(50.61)
II. Smoked					
	(1)	-458.7*	69.35	77.59	-9.786
		(276.4)	(181.2)	(191.2)	(149.5)
	(2)	-464.7*	74.33	-15.18	-12.88
		(281.3)	(174.4)	(188.7)	(149.4)
	(3)	-543.4*	95.56	124.4	-6.182
		(289.7)	(164.1)	(164.9)	(144.5)
	(4)	-458.7**	69.35	77.59	-9.786
		(261.6)	(164.5)	(159.2)	(149.5)
	(5)	-275.5	49.93	183.9	-9.786
		(175.5)	(137.2)	(185.9)	(149.5)
III. Constant					
	(1)	2510***	3129***	3581***	3207***
		(295.8)	(269.2)	(413.5)	(258.3)
	(2)	2466***	3269***	3728***	3257***
		(300.7)	(299.3)	(392.3)	(264.8)
	(3)	2610***	3096***	3847***	3326***
		(297.8)	(224.4)	(402)	(229.1)
	(4)	2510***	3129***	3581***	3207***
		(315.9)	(302.3)	(337.9)	(258.3)
	(5)	2365***	3090***	3827***	3207***
		(316.5)	(256.4)	(342.7)	(258.3)

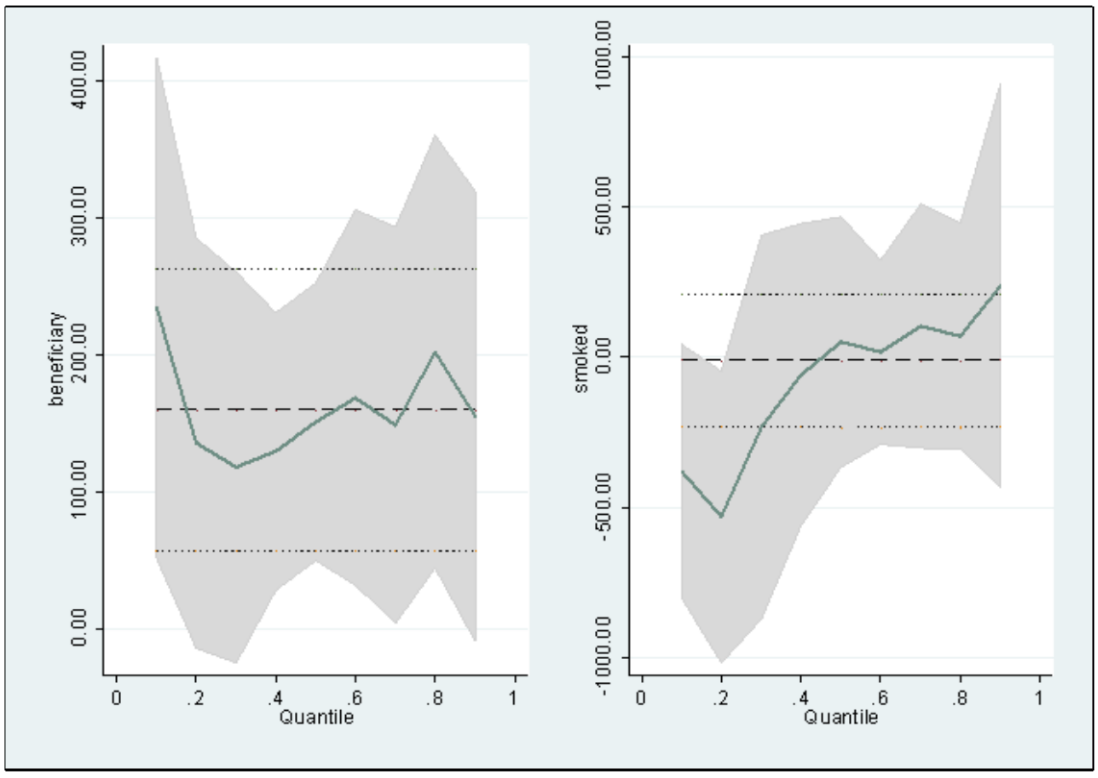
†k is the minimum program exposure in months. Sample size=744, except in (3) where it is 785. (1) baseline; (2) the beneficiary indicator in eq. (2.1) is replaced by the no. of months under the program before birth. The results hold for a baby born into a household with 34 months of program exposure (sample mean); (3) as (1) but adds matches from non-control localities as non-beneficiaries. (4) as (1) but uses cond. quantile treatment effects. (5) as (1) but uses unconditional quantile regressions. SEs in parentheses (robust for OLS, bootstrapped for quantile regressions (1000 (800) reps. for (un)conditional quantiles), except in (4) which uses the Powell (1986) estimator). * p<0.1, ** p<0.05, *** p<0.01.

Figure 2.1: Birthweight distributions for beneficiary and non-beneficiary births†



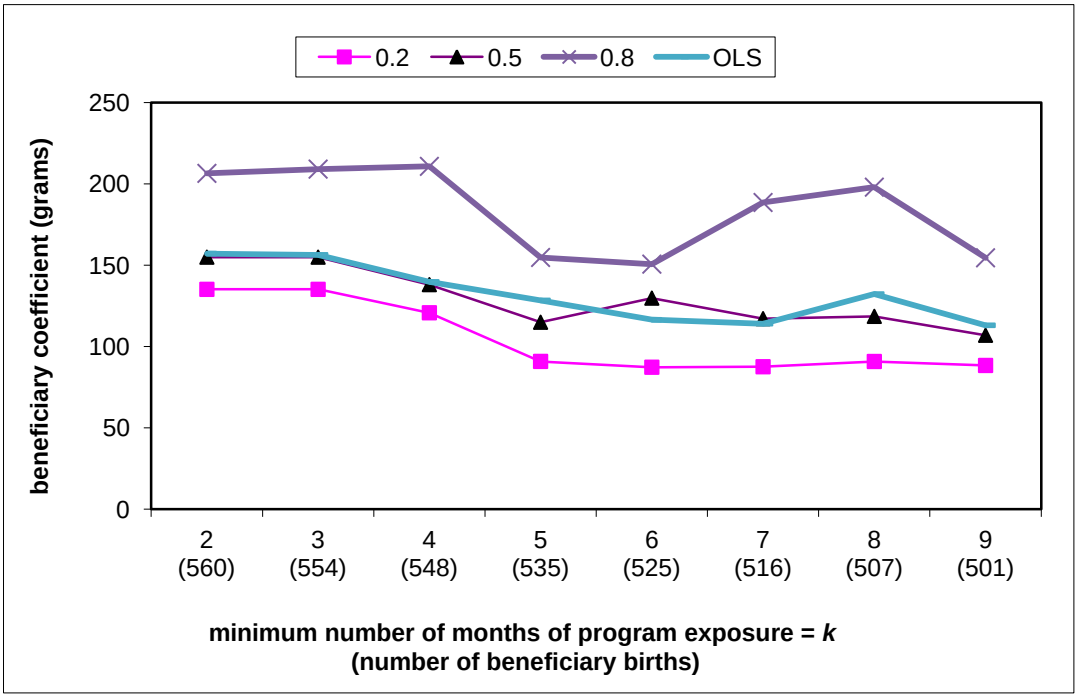
†All densities use an Epanechnikov kernel function and the respective default "optimal" width calculated by Stata.

Figure 2.2: Estimated effect of *Oportunidades* and maternal smoking on birthweight at different quantiles (minimum program exposure is two months)†



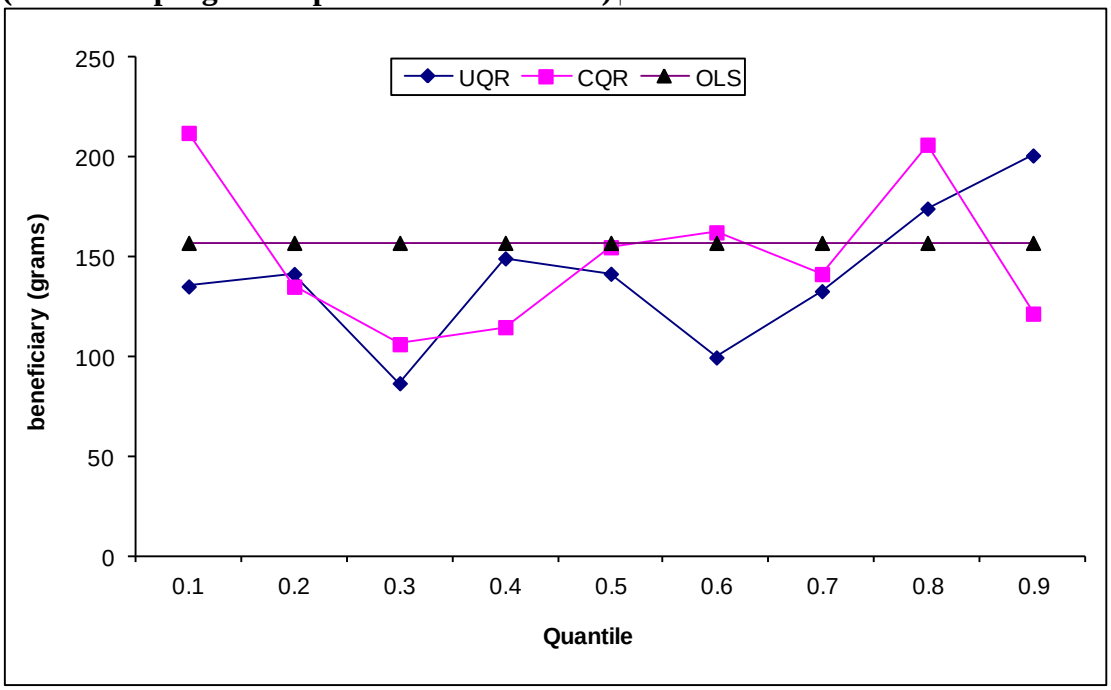
†Plots obtained from estimating equation (2.1) (k=2) using conditional quantiles (continued curve) and ordinary least squares (horizontal dashed line). The respective 95% confidence intervals were obtained using robust standard errors (OLS), and bootstrapped standard errors (800 replications) for the quantile regressions.

Figure 2.3: Estimated program effect as *k* (minimum program exposure) varies†



†Plots obtained from estimating equation (2.1) by ordinary least squares (OLS), and conditional quantile regressions (θ=0.2, 0.5, 0.8) using k=2,3,...,9.

Figure 2.4: Estimated program effect on birthweight at different quantiles (minimum program exposure is two months)†



†Plots obtained from estimating equation (2.1) (k=2) by ordinary least squares (OLS) and conditional (CQR) and unconditional quantile regressions (UQR). The latter were estimated using an Epanechnikov kernel function and the default "optimal" bandwidth calculated in Stata.

3 Chapter 3: First Birth Sex Selection in Delhi, India: The Role of Progressive Gender Attitudes

3.1 Introduction

While India is expected to be the world's most populous country by 2020 (UN (2011)), millions of baby girls may have been selectively aborted (Jha et al. (2011) Bhalotra and Cochrane (2010)) or killed after birth, either actively (Sudha and Rajan (1999)), or passively through neglect over the last decades (Chaudhuri (2012), Miller (1997), Fathalla (1998)). In the absence of any interventions 5 percent more boys than girls are born (Ben-Porath and Welsh (1976), Jacobsen et al. (1999)). This is possibly mother nature's response to the fact that females are more resilient to disease (Teitelbaum (1970)), such that under the same healthcare and nutritional conditions they have lower mortality rates than males across all age groups (Sen (1992)). The population sex ratio, the number of males for every 100 females, is thus normally between 98 and 100 (Coale (1991)). In India however, the most recent census reported a sex ratio of 106 (Registrar General (2011)), and a child sex ratio, which includes only the population in the age group 0-6 years, of 109 (Registrar General (2011)). The sex ratio at birth, the number of males born per 100 females born, was in turn 112 in 2004-2006, and 110 in 2008-2010 (Registrar General (2012)).[98]Those figures are much higher than the biologically

[98]The Registrar General of India, through the Sample Registration System (SRS), provides three-year moving averages of estimates of the sex ratio at birth for India and its bigger states

normal sex ratio of 105 male births per 100 female births,[99] or approximately 48.8 percent females.

The necessity of slowing down population growth was recognized in India since the early years after the independence in 1947 (Haub 2009). In the last decades however, the lower demand for children along with the strong preference for sons and the availability of prenatal sex determination scans has given rise to the phenomenon of female foeticide. Bhalotra and Cochrane (2010) estimate that 0.48 million girls were selectively aborted every year between 1995 and 2005. Likewise, Jha et al. (2011) conclude that 12 million females went 'missing' between 1980 and 2010 due to selective abortions. Even after birth girls may be actively killed (Sudha and Rajan (1999)), or passively by denying them food and / or healthcare (Miller (1997), Fathalla (1998)). Chaudhuri (2012) estimates that 58.29 million girls went missing between 1950 and 2010; out of them, 16.3 million were due to sex selective abortion and the rest, 42 million, to postnatal excess mortality within their first year of life.

India is however not homogeneous and girls are valued differently in different regions, such that sex ratios vary widely across states and union territories (see Table 3.1).[100] According to the Census 2011, the child sex ratio[101] was 118 and 120 in the northern states of Punjab and Haryana respectively, down from 125 and 122 in 2001. At 115, the respective ratio in Delhi was less biased towards boys,[102]

based on data that it periodically collects. Annual data is not released as sampling errors might be large.

[99] China also has very skewed sex ratios. In 2010 the sex ratio was 118 boys per 100 girls at birth, and 105.2 for the overall population (National Bureau of Statistics (2011)).

[100] The first two columns of Table 3.1 present state-level child sex ratios based on census data. Overall male-to-female sex ratios in India also vary a lot across states, ranging from 92 in Kerala to 115 males for every 100 females in Delhi (Registrar General (2011)).

[101] The child sex ratio is considered to be a better measure of sex-selective abortions and infanticide than the sex ratio at birth, as the latter might be inaccurate due to underreporting of home births and unwanted children (Hesketh and Xing (2006)).

[102] In 2008-2010, sex ratios at birth in Punjab, Haryana, and Delhi were respectively, 120, 118,

but unlike the former states it did not experience any improvement between 2001 and 2011, contributing to the highest child sex ratio that India has ever had since 1947, and which was 109 in 2011 (Table 3.1; Registrar General (2011)).

Sex-selective abortions and female infanticide are the most serious examples of the gender based violence that is widespread in India. The recent horrific case of a student who was gang raped in New Delhi, and later died from her injuries, is another example of how vulnerable women are in India (Daniel (2013)). A 2012 survey, polling 370 gender specialists by the Thomson Reuters Foundation, ranked India as the worst place to be a woman among the top 19 economies of the world[103] (Trustlaw (2012)). Violence against women is due in part to the acceptance of society towards it, in particular when the aggressor is the husband. In 2012, UNICEF's Global Report Card on Adolescents found that 53 percent of girls and 57 percent of boys in India think that wife beating is justified (UNICEF 2012); adults hold similar views (Jejeebhoy (1998)). These attitudes that justify and condone violence are due to an existing retrograde, deep-rooted mindset that women are inferior (Bhalla 2012) and / or that they should be submissive, and ultimately have their root in patriarchy (Travers (1997)).

This chapter uses a latent factor model to create an index to measure how progressive women's attitudes towards gender are in India. Being progressive is defined as having attitudes and perceptions favouring the advancement of women towards better conditions in society. Specifically, progressive women decide on their own healthcare, are free to visit the health facility on their own, do not justify wife beating, and think that it is justified to refuse sex to husbands under

and 113, down from 129, 124 and 120 in 2001-2003 (Registrar General (2012)).

[103]This was based on parameters such as quality of health services, threat of physical and sexual violence, level of political voice, and access to property and land rights; even Saudi Arabia, where women are legally discriminated against, ranked higher than India (Trustlaw (2012)).

certain circumstances. The chapter then assesses the effect of *progressivity* on the sex of the first child and on the duration from marriage to first birth in Delhi. Whilst a longer first birth interval will negatively affect total fertility (Trussell and Menken (1978)), and could therefore be seen as a progressive attitude, it might be that some of the women who have not yet given birth have relied on abortions to limit their fertility and achieve a desired offspring sex composition. The chapter finds that a one-standard deviation increase in the *progressivity* index is associated with a 5.8-percentage point increase in the likelihood of a firstborn girl relative to women who have not yet given birth. Likewise, more progressive women do not experience longer first birth intervals which, consistent with the first result, may indicate that they are less inclined to sex-select their first child.

Finding out what types of women are more likely to give birth to / allow the birth of, and ultimately report the birth of a daughter in India[104] is relevant given the consequences of having a deficit of women, especially in the marriage market. Indian states that have been facing such a deficit for some time now have met the situation by *across-region* marriages -the importing of brides from states with less skewed sex ratios (Kaur (2004)), buying wives in neighbouring countries (Das Gupta and Shuzhuo (1999), Blachet (2005)), and the abduction of girls (Kaur (2004)). These practices harm women further as the risk of being kidnapped encourages parents to marry off their daughters at a younger age (Kaur (2004)). Usually, *across-region* and foreign wives are also much younger than their husbands, underage, and more vulnerable to domestic violence (Kaur (2004), Hindin (2002), Rao (1997), Mishra, (2000)). Child brides are not sent to school by

[104]Reporting of daughters is relevant for this chapter as it uses survey data; that is, it relies on the reported sex of the child from mothers. In India, births of girls often go unreported as they are unwanted ((Hesketh and Xing (2006)) and may later be directly or indirecly murdered. Nevertheless, this chapter assumes that more progressive women do report the sex of their children accurately.

their in-laws, tend to have low autonomy levels, and are put under great pressure to become mothers so as to prove their fertility, all of which helps to perpetuate poverty (Otoo-Oyortey and Pobi (2003)). Young girls have a higher risk of dying from pregnancy complications or during childbirth (Mayor (2004)), and to give birth prematurely and / or to low birthweight babies (Khashan et al. (2010)), which in turn contributes to a higher risk of neonatal and infant mortality and morbidity (Friede et al. (1987), McCormick, (1985)). In this context, it will be very difficult for India to meet the United Nation's Millennium Development Goals by 2015.

Increased male-to-female sex ratios have also been found to increase crime rates (Edlund et al. (2007)). Moreover, unmarried, low-status, young males may be more prone to abusing drugs (Kaur (2004), Tucker et al. (2005)) and engaging in risky sexual behaviours (Scott et al. (2012)), which would lead to an increase in HIV/AIDS infection rates (Tucker et al. (2005)). These 'surplus' men may even pose a threat to international peace should their governments fail to engage them in productive activities at home (Hudson and den Boer (2004)).[105] This brings the issue of 'missing' women to the international security agenda.

Previous literature on demographic behaviour in India have generally assumed that women did not try to constrain their fertility prior to first birth (Nath et al. (1999)). This assumption was supported by data from the first round of the National Family Health Survey (NFHS-1 (1992-3)), where only 3 percent of ever-married women initiated the use of contraception before their first birth. Nonetheless, there is disagreement on whether sex selection is used for first order

[105]For China, Xing et al. (2009) have estimated that in 2005 there were 32 million 'surplus' men; that is, young (ages 15-34), low status, unmarried men, which will be unable to find a partner due to the scarcity of women. Similarly, Hudson and den Boer (2004) estimate that the number of 'surplus' males may reach 50 million in China, and between 30 and 35 million in India by 2020.

births. While Jha et al. (2006) using the Special Fertility and Mortality Survey conclude that the largest number of missing girls is for first order births, Retherford and Roy (2003), using the first two rounds of the NFHS (1992-3 and 1998-9), find little evidence of sex selection on first births. More recently, Poertner (2010), using all three available rounds of the NFHS, concludes that sex ratios for first births lie within the normal range. The use of pooled data for the whole of India and several rounds of the NFHS allows the latter studies to analyse time-series variation. Nevertheless, aggregate national data on first births may be hiding significant variation at the state level, similar to the one discussed earlier for child (see Table 3.1) and population sex ratios (Registrar General (2011)). Moreover, the conclusion that most women do not use contraception prior to their first birth does not rule out the possibility of them aborting after getting pregnant and finding out the baby's gender.

Using data from the third round of the NFHS (NFHS-3), this chapter constructs an index to measure how progressive (liberal, non-patriarchal) are women's attitudes towards gender in India by estimating a multilevel latent factor model. Such a model allows controlling for correlation between observed characteristics that may influence demographic outcomes and any unobserved heterogeneity. The chapter then assesses the effect of *progressivity* on the firstborn's gender and on the duration from marriage to first birth in India's National Capital Territory (NCT), Delhi. The reason for focusing on Delhi is that, in contrast to what previous literature have found by pooling data for the whole of India, it has a deficit of females even among first order births. Moreover, unlike other Indian states, Delhi's skewed child sex ratio did not experience any improvement over the 2001-2011 decade (see Table 3.1; Registrar General (2011)). Furthermore, Delhi had access to sex determination scans as early as 1975; that is, earlier than any other

Indian state or union territory (Sudha and Rajan (1999)). Lastly,[106] over the years Delhi has received millions of economic migrants,[107] including females, from the rest of India which may be particularly willing to postpone first birth.

The chapter finds that more progressive women are more likely to have a first-born girl. Specifically, a one-standard deviation increase in the *progressivity*'s level is associated with a 5.8-percentage point increase in the likelihood of a first-born girl relative to women who have not yet given birth. The effect is robust to the set of covariates used to create the *progressivity* index and increases if the analysis is restricted to women who married after the introduction of ultrasound diagnostic facilities. The estimated *progressivity* impact implies that an extra 3,809 girls would have been born in the NCT of Delhi in 2009. This is 68 percent of the number of missing girls among first births that there might be based on the estimated total number of missing girls in Delhi (UNFPA (2011)).[108] Ad-

[106] Amniocentesis techniques that, apart from detecting foetal abnormalities, reveal the sex of the foetus were developed at the All India Institute of Medical Sciences in New Delhi in 1975 (Sudha and Rajan (1999)). Chhachhi and Sathyamala (1983) report that 88 percent of couples who volunteered for the test in that year, having already two or more daughters, had an abortion after learning that their expected child was female.

[107] In fact, since 1994, Delhi's annual population growth has increased more due to newly arrived migrants than to the natural population growth (Government of NCT of Delhi (2011)).

[108] The United Nations Population Fund (UNFPA) - India (2011) estimated that there were 11,243 girls 'missing' each year between 2004-2008 in Delhi due to prenatal sex selection. Given that the proportion of first order births among live births in Delhi in 2010 is 0.502 (Registrar General (2012)), there would be 5,643 missing girls among first order births each year. 3,809 is 68 percent of that amount. Although this estimation is of course not exact as it assumes that the birth order distribution for abortions is the same as the one for live births, it is indicative of the strenght of the *progressivity* effect. On the other hand, the number of extra girls was calculated based on a sex ratio at birth of 113 girls per 100 boys in 2008-2010 (Registrar General (2012)), an estimated 279,000 total live births in Delhi (Johnston (2012)) in 2009 (the mid-year of 2008-2010), and the afore mentioned proportion of first order births among live births in Delhi in 2010. The estimated number of firstborn girls in Delhi in 2009 is thus 65,687, and 5.8 percent of that amount is 3,809. Using the same methodology, the number of firstborn girls in Delhi in 2007 would be 63,563. 5.8 percent of that amount is 3,686, which is 65 percent of the number of missing girls among first births that there may be based on a total of 11,243 missing girls (UNFPA (2011)). The last figures are based on a male to female sex ratio at birth of 114 in 2006-2008 (UNFPA (2011)), 271,000 total live births in 2007 (Johnston (2012)), and assuming that the proportion of first order births in Delhi among live births in 2007 was the same as in 2010. Note that I was unable to access information on the percentage distribution of newborns by birth order for years prior to 2010, as older Statistical Reports of the Sample Registration

ditionally, more progressive women do not experience longer first birth intervals which, together with them being more likely to have a firstborn girl, may indicate that they are less inclined to sex-select their firstborn. These results imply that women should be taught about their human rights and gender equality, both in school and through media campaigns. More generally, regional governments should introduce and expand interventions aimed at subsidising and empowering women. Crucially, massive media campaings promoting the idea that dowries and son-preference are old-fashioned should be considered.

The rest of the chapter is divided as follows. Section 3.2 describes the data, sample, and descriptive statistics. Sections 3.3, 3.4, and 3.5 deal with the progressivity index, the firstborn's gender, and the duration from marriage to first birth, respectively. Section 3.6 concludes.

3.2 Data, sample & descriptive statistics

3.2.1 Data & sample

The data come from the third round of the NFHS (NFHS-3) only, as previous rounds do not contain some of the questions that were used to construct the *progressivity* index. The NFHS-3 was conducted in 2005-2006, it is representative at the state level and interviewed a total of 124,385 women aged 15 to 49 years. In order to have a nationally representative *progressivity* index, the latter was estimated for a total of 83,556 women (36,795 residing in cities and 46,761 in the country side) who are currently married and are usual residents in the state where

System are not accessible free of charge.

they were interviewed.

Nevertheless, the models on the firstborn's gender and on the duration to first birth should focus on Indian states with skewed sex ratios. Table 3.1 shows the proportion of females among first order births by state (column 8), and the p-value (column 9) for the null hypothesis H_0; $P = 0.488\, v\, H_1 : P \neq 0.488$, where 0.488 is the biologically normal proportion of females at birth. The sample includes 80,674 currently or formerly married women who are usual residents in the state where they were interviewed, and whose first birth was a singleton. Although in some states, including Haryana, the sex ratio seems to be female biased, the null hypothesis cannot be rejected in any of those cases at conventional significance levels. In contrast, at the 10 percent significance level, Punjab, Delhi, Rajasthan, Sikkim, Arunachal Pradesh, Mizoram, and India as a whole exhibit a deficit of females compared to the natural sex ratio.[109] In 2001, each of these states had a higher than normal male to female sex ratio (see Table 3.1, column 1). Nevertheless, in the case of Sikkim, Arunachal Pradesh, and Mizoram, their respective child sex ratios (column 3 and 5) could be considered normal.[110]

This chapter focuses on India's National Capital Territory, Delhi, as in that case the null hypothesis is rejected at the 1 percent significance level. Moreover, Delhi is widely recognized as one of the Indian states / union territories having an unnaturally low female to male sex ratio (at birth, in the 0-6 age bracket, and in the overall population), and between 2001 and 2011, it did not experience any

[109]The fact that Haryana does not appear in this list may be surprising but is consistent with Visaria (2005), who in focus group discussions with families in that state (and in Gujarat) was told that they do not attempt sex selection for first births. Furthermore, Haryana's high total fertility rate (2.7 compared to 2 in Punjab, 2.13 in Delhi, and 2.68 in India as a whole (NFHS-3)) may allow families not to sex select their first child, but start doing so at higher parities. In contrast, families in Punjab and Delhi may start sex-selecting their offspring already from their first child, as they aim at having smaller families.

[110]Although there is no biologially 'normal' sex ratio for the population aged 0-6, we know that the sex ratio at birth should be 105, and that for the overall population it should be 98-100, so a child sex ratio of 104, which is what those three states have, could be considered to be normal.

improvement in its child sex ratio (see Table 3.1; Registrar General (2011)).

The models on the firstborn's gender and on the duration to first birth were thus estimated on a sample of 2032 currently married women who are usual residents in Delhi. Moreover, in case they have not yet given birth, these women have been married for at least 9 months or, if they have already given birth, their first child was a singleton and was born at least nine months after marriage. Finally, these women have married only once. This last restriction was needed in order to assure that relevant partners' characteristics, such as age and education, belonged to first husbands, who have presumably fathered the firstborns.

3.2.2 Descriptive Statistics

Table 3.2 reports descriptive statistics for all the variables that will be used as covariates in the regression analyses. They are shown separately for the whole of India (including Delhi) by place of residence (urban / rural) on the one hand, and for Delhi on the other hand. On average, women residing in cities marry at 18.8, those in Delhi at 18.5, and those in the country side at 17.3 years old, respectively. Urban and Delhi women are also one year older than their rural counterparts (33 versus 31.8 years). As for age difference between spouses, urban and rural women are very similar in that regard. Specifically, around 55 percent of women (56 in the country side) are between 2 years older and five years younger than their husbands, compared to 72 percent of women in Delhi. Similarly, 44 percent of women in cities (43 in the country side) are at least six years younger than their husbands, compared to only 28 percent of women in Delhi.

On the other hand, urban women and those in Delhi are on average much

more educated than rural women. Whilst slightly more than a third of women in cities and in Delhi have incomplete primary or no formal education, 61 percent of rural women are in such circumstance. Furthermore, 38 percent of women in cities have some secondary education and 24 percent of them have completed secondary education or more. The respective proportions for women in Delhi are 28 and 32 percent. In contrast, the respective proportions for rural women are only 26 and 5 percent.

Regarding caste, 47 and 64 percent of women in cities and in Delhi respectively, belong to the 'normal' caste or did not provide information on this variable, compared to only 32 percent of women in the country side. In contrast, 17 percent of rural women belong to a scheduled caste, and only 7 percent of women in cities do so. The respective number for Delhi is merely 1 percent. As for religion, Hindus account for more than 70 percent of women in each of the places under investigation. Specifically, they account for 72, 76, and 86 percent of women in cities, the country side, and Delhi, respectively. The percentage of Christians in cities and the rural side is about the same (7 and 8 percent respectively), but it is significantly lower in Delhi, being only 1 percent.

Turning to wealth quintile, which is an index measuring household assets rather than income itself,[111] we see that 81 and 85 percent of women in cities and in Delhi, respectively, belong to either the fourth or fifth quintile. Interestingly, there is no one in the poorest quintile in Delhi. In contrast, there are 12, 23, 24, 20, and 21 percent of rural women in each wealth quintile from bottom to top respectively. As for family structure, we see that a larger proportion of women live in extended families in the rural side, 49 percent, compared to 44 percent of urban women, and 42 percent of women in Delhi.

[111] The index was constructed through factor analysis and is ready available in the NFHS-3.

Finally, regarding media contact, a similar proportion of urban and rural women, 46 and 43 percent respectively, listen to the radio at least once in a while. In contrast, 59 percent of women in Delhi do so. Furthermore, large differences exist regarding newspaper reading and TV watching between urban and Delhi women on one hand, and rural women on the other. Whilst only one in four rural women read the newspaper at least once in a while, 54 and 55 percent of Delhi and urban women respectively, do so. This is understandable given the educational attainment figures described earlier. Similarly, 90 and 91 percent of women in cities and in Delhi, respectively, watch TV at least once in a while, compared to 57 percent of women in the country side. This large difference might be explained by the lack of electricity in rural areas.

3.3 *Progressivity* index

In India, sons are preferred over daughters due to religious, cultural, and economic reasons. Many Hindu sects call for a son to light a parent's funeral pyre in order for them to reach Nirvana, the release from the cycle of reincarnation. In traditional patriarchal societies, girls move to live with their in-laws at marriage, and thereby stop providing economic support to their parents, whilst sons remain at home and provide for them. Furthermore, although outlawed in 1961, the custom of dowry, by which the bride's family transfers gifts and wealth to the groom's family upon marriage, has, in the last decades, spread to communities and castes where it had never existed (Sudha and Rajan (1999)). Consequently, a daughter is often seen as a burden and a son as an investment. Additionally, there are some ancient scriptures, which may still have some influence on at least some parts of Indian

society, that describe women as being inferior and subordinate to men.[112] In this context, passively or actively killing a daughter, before or after birth, may be seen as an affirmation of the patriarchal social order which, from a human rights point of view, may be seen as retrograde.

There is thus some unobserved heterogeneity which will make some women go from preferring sons to killing or allowing others to kill a daughter, passively or actively, before or after birth. This chapter hypothesizes that more progressive women, those who favour the advancement of society towards improved conditions, are less likely to sex-select their offspring and to neglect their daughters after birth, such that they are more likely to report having had a female first-born.[113] Furthermore, whilst a longer first birth interval will negatively affect

[112]For instance, the Ramcharitamanas of Tulsidas, a 16th century epic poem reads "drums, uncivilized illiterates, lower castes, animals and women are all fit to be beaten". In spite of this, it is considered to be one of the masterpieces of medieval Hindu literature (Britannica Online Encyclopædia (2013)). Other examples come from the Dharma-shastras, the ancient law books or "laws of righteous conduct" that formed the basis for the social and religious code of conduct in areas where the Hindu dharma (religion) was implemented. Although it is difficult to know how seriously these laws were enforced by the ruling classes, one can trace back to them several social and religious practices of some groups in India (see http://www.hinduwebsite.com/). The Vashistha, for instance, reads: "Out of fear of the appearance of the menses, let the father marry his daughter while she still runs about naked. For if she stays (in the home) after the age of puberty, sin falls on the father" [Vashistha (17.70)]. Similarly, the *Manu-smriti* or Laws of Manu, which were compiled over the years between 200-400 AD, prescribe the subservience of women to men (see, for instance, the English translation by G. Buhler (1886)). Some passages read: "In childhood a female must be subject to her father, in youth to her husband, and when her lord is dead, to her sons; a woman must never be independent" [Manu V, 148]; "Though destitute of virtue, or seeking pleasure (elsewhere), or devoid of good qualities, (yet) a husband must be constantly worshipped as a God by a faithful wife [Manu V, 154]"; "Women do not care for beauty, nor is their attention fixed on age; (thinking) '(It is enough that) he is a man', they give themselves to the handsome and to the ugly" [Manu IX, 14]; "A man, aged thirty years, shall marry a maiden of twelve who pleases him, or a man of twenty-four a girl eight years of age" [Manu IX, 94]; etc. These moral prescriptions may explain in part why child marriage is widespread in India, and why young girls are sometimes married off to men who are much older than them. According to the NFHS-3, 51 percent of women got married before their 18 birthday, and 27 percent are married to men who are at least 8 years older than them.

[113]This addresses the concern that sex ratios at birth might not be as skewed as reported because of recall problems. That is, it might be that some women had a firstborn girl, whom they neglected and therefore passed away soon after birth; then they had a second child who was a boy and reported him as the firstborn due to not remembering their firstborn girl. If such recall problem exists then the reported sex ratios are not "at birth" but rather child sex

total fertility (Trussell and Menken (1978)), and could therefore be seen as a progressive attitude, it might be that some of the women who have not yet given birth have relied on abortions to limit their fertility and achieve a desired offspring sex composition. Women's level of *progressivity* may thus potentially influence the duration to first birth, total fertility and, through sex-selective abortions and strategic negligence, the actual sex composition of the offspring.

3.3.1 Measurements

Women's true level of *progressivity* is a relative and multidimensional latent variable which may potentially influence demographic outcomes. This chapter constructs an index to measure women's level of *progressivity* using answers to survey questions on wife's attitudes and perceptions regarding gender interactions that affect women's health, both physical and emotional, and including reproductive health. The index will then be included as an additional covariate in a baby's sex equation and in a duration to first birth model to control for unobserved heterogeneity.

Specifically, the questions used to construct the index involve the following four spheres:

1. Decision making regarding own healthcare.

2. Freedom of movement to visit the health facility.

3. Perceptions towards wife beating due to a number of specific reasons.

4. Perceptions towards women's right to refuse sex within marriage due to a number of specific reasons.

ratios. This however does not affect the analysis as we, humans, should care about girls being killed, regardless of whether it is before or after birth, such that it does not matter whether the reported sex ratios are at birth or child sex ratios.

From each question, whose exact wording is given in Appendix A, a fallible measurement of women's latent level of *progressivity* was created in the form of an indicator (1=progressive; 0=otherwise) variable ω_q, q=1,...,4, as follows:

$\omega_{i1} = 1$ if woman i decides alone on her own healthcare; 0 otherwise.
$\omega_{i2} = 1$ if woman i is allowed (by husband) to go alone to the health facility; 0 otherwise.
$\omega_{i3} = 1$ if woman i believes that a husband is not justified in beating his wife under any of the following seven circumstances. If she: goes out without telling him, neglects the house or the children, argues with him, refuses sex, does not cook properly, shows disrespect for in-laws, or if his husband suspects her of being unfaithful; 0 otherwise
$\omega_{i4} = 1$ if woman i thinks that a wife is justified in refusing sex under each of the following three circumstances: if she is tired or not in the mood, her husband has a sexually transmitted disease, or her husband has other women; 0 otherwise.

As the *progressivity* distribution may depend on place of residence, Table 3.3 reports mean values for each of the four *progressivity* measurements for the whole of India (including Delhi) by urban / rural residence, and for Delhi on its own. Women in Delhi are on average more emancipated than those residing in cities, and the latter in turn are more liberal than rural women. The sphere with the lowest proportion of women answering in a progressive way is ω_1, decision making regarding own healthcare, where only about a third of women usually make decisions on this matter. The exact proportions are 27, 31, and 35 percent of women in the country side, cities, and Delhi, respectively. These proportions are very low and are consistent with anecdotal evidence showing that women abort female

foetuses, often because they are pressed to do so by their husbands or in-laws.[114]

The measurement having the second lowest proportion of women answering in a progressive way is ω_3, perceptions about wife beating. In that case, only 37, 53, and 62 percent of women in the country side, cities, and Delhi, respectively, believe wife beating is not justified under any circumstance. This finding makes it clear that patriarchal values are very entrenched in the psyche of Indian women, such that in some circumstances wife beating is considered a husband's 'right'. As for ω_2, freedom to visit the health facility unaccompanied, only 50, 67, and 73 percent of women in the rural side, cities and Delhi, respectively, enjoy this freedom.

Finally, 68, 76, and 77 percent of women in the country side, cities, and Delhi respectively, think a wife is justified to refuse sex with her husband if she is tired or not in the mood, if her husband has a sexually transmitted disease, or if he has sex with other women. Overall, women in Delhi thus seem to be more liberal compared to women in the rest of India, yet that territory has one of the highest sex ratios in the country. The reported figures however are mean values and so, it might still be that variation in *progressivity* within Delhi helps to explain the sex of the first child and the duration to first birth. These hypotheses will be analysed in Sections 3.4 and 3.5, respectively.

3.3.2 Model and estimation

Define α_i as woman i's unobserved heterogeneity term, which is the true, latent, level of *progressivity*. α_i is a culturally determined trait that is influenced by some

[114]See for instance a BBC report on female foeticide in south-west Delhi (http://www.bbc.co.uk/news/world-south-asia-13264301)

of woman i's observed characteristics, $\mathbf{z_i}$, and it in turn affects her answers to questions regarding issues that affect women's physical, emotional, and reproductive health. That is, α_i affects the value of each of the four binary, fallible *progressivity* measurements ω_q, q=1,...,4. Assuming that at each *progressivity* level the probability that a woman with that level of *progressivity* will answer 'yes' to one of the measurements ω_{iq} is of the logit form, the relationships between α, $\mathbf{z}$, and ω_q can be summarized by a two-equation system as follows.

$$\omega^*_{iq} = \lambda_{0q} + \lambda_{1q}\alpha_i + \vartheta_{iq}, \qquad q = 1, ..., 4, \qquad \text{with} \quad \omega_{iq} = \begin{cases} 1 \text{ if } \omega^*_{iq} > 0 \\ 0 \text{ otherwise} \end{cases} \tag{3.1}$$

$$\alpha_i = \mathbf{z}'_i\gamma + u_i \tag{3.2}$$

Where:

ω_{iq}, $q = 1, ..., 4$ =Observed, fallible, measures of α_i as outlined in Section 3.3.1.

$\mathbf{z}$ = Woman i's observed characteristics: age at marriage, current age, age difference between spouses, education, caste, religion, husband's polygamy indicator, wealth quintile, family structure, frequency of media contact, and state indicators.

λ_{0q} and λ_{1q}, $q = 1, ..., 4$ are the intercepts and factor loadings respectively. For identification, the first loading, $\lambda_{11} = 1$, so the other loadings are estimated with respect to it, and the variance of the *progressivity* trait can be estimated freely.

Equations (3.1) and (3.2) were estimated jointly by maximum likelihood using the gllamm routine in Stata under the assumption that the u_is are normally distributed. As women in rural and urban areas may be drawn from different distributions, and therefore behave differently, the joint model was estimated separately by place of residence. In each case, the Bayesian posterior, the estimated posterior conditional mean of the latent variable, $\hat{\bar{\alpha}}_i \equiv E(\alpha_i|z_i, \omega_{iq})$, $q = 1, ..., 4$,

was obtained[115] and standardized with respect to each subsample (rural / urban). The latter is called *progress* and informs us about the underlying level of *progressivity* conditional on the observed behaviour. In the next sections, the subsample of women in Delhi will be extracted, and *progress* will be incorporated as an additional covariate in models to estimate the demographic outcome y_i. Path diagram 3.1 illustrates the relationship among equations (3.1), (3.2) and the estimation equation for y_i.

3.3.3 Results

Figure 3.1 plots the estimated *progressivity* index, *progress*, for the whole of India (including Delhi) and for Delhi on its own. We see that the index is somehow shifted to the right in the subsample, implying that women in Delhi are on average more progressive than in the rest of India. This is consistent with Table 3.3, where we saw that in general, a higher proportion of women in Delhi had progressive views compared to women in the whole of India.

The results from estimating the *progressivity* model are reported in Tables 3.4 (equation (3.1)) and 3.5 (equation (3.2)). The estimated intercepts and factor loadings reported in Table 3.4 were then used to plot Item Characteristic Curves (ICCs) for each measurement, separately by place or residence, in Figures 3.2 (rural) and 3.3 (urban). ICCs plot the probability of a measurement taking the value of one against the *progressivity* index. The higher the factor loading the steeper the curve will be, such that small changes in *progressivity* will yield large changes in the probability and so, the better a measurement will be at discrim-

[115]This is known as the Bayesian shrinkage estimator, see Goldstein (2003).

inating between very progressive and less progressive women. The intercept in turn informs us about the probability of women answering 'yes' to a *progressivity* question given an average *progressivity* index value of 0.

The slope coefficients in Table 3.4 show that different measurements have different relative importance depending on women's place of residence, and this is reflected in the ICCs. For the rural sample (Figure 3.2), the most important *progressivity* measurement, the one with the largest factor loading, is ω_2, whether a woman has the freedom to go to the health facility on her own. Consequently, the respective ICC in Figure 3.2 shows that this measurement allows discrimination between very progressive and less progressive women: small changes in *progressivity* bring about large changes in the probability of answering 'yes' to the question. The large negative intercept in turns implies that women with a below average *progressivity* index (lower than 0) have an almost zero probability of having the freedom to go to the health facility on their own. Women with a *progressivity* index which is one standard deviation away (i.e. equal to 1) have a very high probability of having the freedom to go to the health facility unaccompanied.

The first measurement, whether the respondent usually makes decisions on her own healthcare, also allows us to differentiate across *progressivity* levels among rural women in India to a certain extend. For instance, women with a value of zero in the *progressivity* index have a 16 percent likelihood of deciding on their own healthcare, whilst women with a *progressivity* index of four have a 50 percent chance of usually making such a decision. In contrast, ω_3 and ω_4, whether the respondent does not justify wife beating and whether she justifies refusing sex within marriage, have a very low factor loading. Consequently, their respective ICCs have a low slope and therefore, do not discriminate between very progressive and less progressive women.

As for the urban sample, it is ω_3, whether the respondent does not justify wife beating, the one that best discriminates between very progressive and less progressive women due to its high factor loading. Specifically, Figure 3.3 shows that women with very low *progressivity* levels have a close to zero probability of agreeing that a husband is not justified in beating his wife, whilst women with a very high *progressivity* index have an estimated probability of 0.85 of agreeing with that view. On the other hand, and unlike ω_1, the ICCs corresponding to ω_2 and ω_4, whether the respondent has the freedom to go to the health clinic on her own, and whether she thinks that refusing sex to husbands is justified, are also steep enough as to being able to discriminate between very progressive and less progressive women.

Table 3.5 reports the results from estimating equation (3.2). Note that, as the latent trait does not have a well-defined measurement scale, it is only possible to talk about correlations between covariates and the level of *progressivity*, but not about precise point estimates. The table shows that most regressors are statistically significant and have the expected sign. Specifically, the correlation between age at marriage and *progressivity* is positive in cities but negative in the rural side. This makes sense as women in urban settings may have more decision making autonomy as to be able to choose to marry at an older age. In contrast, in rural areas it may be more difficult to contradict the family, who often press for an early marriage, such that marrying at an older age may be due to not finding a suitable partner because of some individual characteristics which are not controlled for here (e.g. physical appearance or the number of elder sisters[116]), and which also make women less confident and more submissive in all aspects of

[116]Taking the wealth quintile constant, a family with more daughters will find it more difficult to meet the dowry requirement necessary to marry off their girls, especially the young ones (Kaur (2004)) as they may have already ran out of savings or acquired too much debt in order to marry off the elder daughters.

their life.

Similarly, there is a positive correlation between age and *progressivity*. This makes sense as women in the sample are aged 15 to 49 years such that older women may have gained people's respect and may thus be more mature, experienced and confident as to know their rights better, and step out of the house on their own. On the other hand, women who are older than their husbands were found to be less progressive.

Turning to education and caste indicators, we see that there is a positive and monotonic relation between education and *progressivity*. Lower caste status (the scheduled castes, tribal communities and other backward castes) is associated with lower *progressivity* in urban settings but rural women from schedule castes are more progressive. This makes sense as traditionally, people from schedule castes / tribes are characterized by more gender-egalitarian cultures (Sudha and Rajan (1999)). Nevertheless, people from lower castes in cities may become less progressive by trying to emulate the customs of upper castes, including female seclusion, in order to achieve class mobility. This process is known as 'Sanskritization' ((Sudha and Rajan (1999)).

As for religion, compared to Hindu women, Muslim religious status is associated with lower *progressivity*; whilst Christian, other (Jainism, Judaism, Zoroastrianism, Donyi-Poloism, or other), as well as not practicing and not having given information about religious status, is associated with higher *progressivity*. Lastly, compared to Hindu women, Sikh religous status in cities and Buddhism in rural areas are associated with higher *progressivity*.

There is also a positive and monotonic relation between the household assets index and *progressivity*. Likewise, belonging to a nuclear family and having some media contact are both associated with higher levels of *progressivity* regardless of

place of residence. The latter makes sense as the media may make women more aware of their human rights. Similarly, women in nuclear families may have less pressure from their in-laws, such that their way of thinking and behaving may be less patriarchal and more progressive. Lastly, the state indicators show that urban women in Himachal Pradesh, Delhi, Rajasthan, Uttar Pradesh, West Bengal, Jharkhand, Chhatisgarh and Madhya Pradesh are more progressive than similar women in Maharashtra. On the other hand, rural women in Bihar, Nagaland, Orissa, Chhatisgarh and Karnataka are less progressive than similar women in Uttar Pradesh.

3.4 Firstborn's gender

3.4.1 Model and estimation

Assume all women have access to prenatal sex determination technology and abortion services such that they can choose whether or not to have a child and the sex of the offspring. Assume further that each woman i has preferences defined over the set of alternatives C_i= {no child yet, first child is a boy, first child is a girl} and that she derives utility from her choice. That is,

$$U_i(alternative\, j) = \mathbf{x_i'}\beta_j + \phi_j progress_i + \varepsilon_{ij}, \qquad j = 0, 1, 2 \tag{3.3}$$

where:

$\mathbf{x}$=Woman i's observed characteristics: age at marriage, age difference between spouses, own and husband's educational attainment, caste, religion, wealth quintile, family structure and rural residence.

$progress_i$= Woman i's estimated *progressivity* index.[117]

Assuming that the error term ε_{ij} is orthogonal to $\mathbf{x}$, a multinomial logit model can be used to describe each woman's decision making process as follows (McFadden (1974)). Assume that the stochastic individual specific terms ε_{ij} are independently distributed, each with an extreme value cumulative distribution function $F(\varepsilon_j) = \exp(-\exp(-\varepsilon_j))$. Therefore, the probability that woman i chooses alternative j is:

$$\Pr(y_i = j) = \Pr(U_{ij} > U_{iq}) \forall q \neq j$$

For independent extreme value distributions this probability is given by:

$$\Pr(y_i = j) = \Pr(j|\mathbf{x_i}) = \frac{\exp(\mathbf{x_i'}\beta_\mathbf{j} + \phi_j progress_i)}{\sum_{g=0}^{2} \exp(\mathbf{x_i'}\beta_\mathbf{g} + \phi_j progress_i)}, \quad j = 0, 1, 2 \tag{3.4}$$

3.4.2 Baseline results

Given the sample of 2032 women in Delhi, the mean of the categorical outcome variable is 1.37, and its standard deviation 0.6082. In that sample, 6.84 percent of women had not yet given birth by the time of the interview, 49.41 percent of them had had a firstborn son, and 43.75 of them a firstborn daughter.

Table 3.6 presents the results from estimating equation (3.4). Although several estimated coefficients in each of the two gender equations are statistically signif-

[117] One could think of the original set up of the model as being: $U_i(alternative\, j) = \mathbf{x_i'}\beta_j + v_{ij}$, $j = 0, 1, 2$,where $v_{ij} = \alpha_i + \varepsilon_{ij}$. Nevertheless, as $\alpha_i = \mathbf{z}_i'\gamma + u_i$ (by equation (3.2)), there is correlation between the error term, v_{ij}, and the observed characteristics $\mathbf{x}$ through *progressivity*, α_i. In order to disentangle the correlation, an estimator (*progress*) for α_i was obtained separately from $U_i(\bullet)$, and plugged back into the latter equation, to obtain equation (3.3). Alternatively, the correlation between the observed characteristics, $\mathbf{x}$, and the error term, v_{ij}, could in general be accounted for by exploiting within variation in a panel. Unfortunately this solution could not be used as the NFHS-3 is a cross-section. Likewise, one could capture the correlation by using time averages of the observed characteristics as suggested by Mundlak (1978). Nonetheless, this solution could not be used neither as the explanatory variables are time invariant.

icant, the respective marginal effects are not significant at the 5 percent level, except in the case of the *progressivity* index in the girl equation. Specifically, a one-standard deviation increase in the level of *progressivity* is associated with a 5.8 percentage point increase in the probability of having a firstborn girl compared to women who have not yet given birth *ceteris paribus*.

3.4.3 Robustness checks

Table 3.7 presents the results from several robustness checks. Model [2] re-estimates equation (3.4) using only the subsample of observations who are either censored or whose firstborn is still alive.[118] The results are very robust. The estimated *progressivity* effect is now 5.9 percentage points and is significant at the 5 percent level, *ceteris paribus*.

Model [3] re-estimates equation (3.4) using the full sample of 2032 women and a *progressivity* index that was constructed using only "hard" covariates. That is, those which one can expect to have remained constant throughout the years. These are: age at marriage, current age, age difference between spouses, education, religion, caste, and the state indicators. This was done as the original index may not be accurately measuring women's progressive thinking at the time of marriage, as women's observed characteristics may have changed between that date and the time of the interview. The results show that a one-standard deviation increase in the 'hard' *progressivity* index is associated with a 5.4 percentage-point increase in the likelihood of having a firstborn girl, and is significant at the 5 percent level *ceteris paribus*.

[118] In this case, the gender distribution would be 7.27, 48.48, and 44.25 percent censored observations, boys, and girls respectively. That is, in this sample, boys do seem to have higher reported mortality. Still, Table 3.7 shows that the results are robust to dropping out mothers whose firstborn past away.

Model [4] re-estimates equation (3.4) using only the post-ultrasound sample. That is, women who married in or after 1985 (as suggested by Bhalotra and Cochrane (2010)),[119] and the baseline index. In that case, a one-standard deviation increase in the *progressivity* index is associated with a 7.6 percentage-point increase in the likelihood of having a firstborn girl at the 5 percent significance level, *ceteris paribus*.

Model [5] re-estimates equation (3.4) using the baseline index and the subsample of women who married at most 12 years before the interview. That is, in or after 1994. This was done as it is unlikely that women's level of *progressivity* remained constant throughout the years. Things in India have changed and women may now think in a less traditional way, such that their perceptions regarding wife and husband rights may be different now than when they first married. 1994 is also the date when the ultrasound started to be widely available (as suggested by Bhalotra and Cochrane (2010)). In this case, a one-standard deviation increase in the *progressivity* index is now associated with a 7.7 percentage-point increase in the likelihood of having a firstborn girl at the 10 percent significance level, *ceteris paribus*.

Table A3.5 in the Appendix presents the results from testing for reverse causality, that is, from regressing *progress* on the sex of the first child. This was done as literature on voting behaviour show that children of different sex influence parental behaviour differently. In particular, Washington (2008) finds that daughters increase a congressperson's propensity to vote liberally, specially on reproductive

[119]Using nonparametric plots and flexible parametric specifications of the average sex ratio at birth for the whole of India, Bhalotra and Cochrane (2010) identify 1985 as a break point in the sex ratio trend. Therefore, they define the "post-ultrasound" period as 1985-2005. Nevertheless, as already mentioned in the introduction, amniocentesis techniques were available in Delhi as early as 1975; that is why the baseline specification considers all women in the sample, even when the ultrasound was not supposed to be available. Furthermore, remember that skewed sex ratios are due not only to prenatal sex selection but also to excess postnatal mortality of girls, which may differ from the mortality reported by mothers.

rights issues. Similarly, Oswald and Powdthavee (2010) find that daughters (sons) make people more likely to vote for left-(right-)wing political parties. As for this chapter, it might be that a firstborn son helps women to improve the relationship with their husbands such that they do not get battered anymore (in case they were) and so, women now find wife beating justified. On the other hand, a firstborn girl may turn women more progressive and make them stand against patriarchal norms. The results in the first column of Table A3.5 relate to a univariate model with the baby's gender, and a constant, as the only covariates, and those in the second column to a model that controls for the confounding factors $\mathbf{x}$ outlined in Section 3.4.1. Endogeneity does not seem to be present.

Table A3.6 in the Appendix presents the results from estimating the firstborn's sex equation using a simpler *progressivity* index. That is, one that was constructed as the arithmetic mean of the four *progressivity* binary indicators. The results show that a "fully" progressive woman (i.e. one who decides by herself on her own healthcare, is free to go on her own to the health clinic, does not justify wife beating under any circumstance, and thinks that refusing sex to husbands is justified) is 8.3 percentage points more likely to report a girl as the firstborn compared to women who have not yet given birth, and who are not progressive at all as measured by the four *progressivity* indicators in the previous parenthesis.

Table A3.7 in the Appendix shows in turn the results obtained from estimating the firstborn's sex equation substituting the four binary *progressivity* measurements for the index. In that case, we see that only the first indicator, whether a woman decides by herself on her own healthcare, significantly affects the (reported) biological sex of the firstborn. Specifically, women who decide by themselves on their own healthcare are 4.9 percentage points more likely to report a firstborn daughter, compared to women who are still childless, and who let others

decide on the use of healthcare for them.

The baseline *progressivity* index (i.e., the one estimated using a latent factor moder) is however the preferred one. The reason is that it has been estimated using a methodology that takes into account any correlation that may exist between women's latent, unobserved *progressivity*, and their observed characteristics. In order to test the predictive power of that index, equation (3.4) was estimated for two other Indian states: Kerala and Punjab. The results are shown in Tables A3.8 and A3.9 in the Appendix, respectively. *Progressivity* is not found to significantly affect the probability of having (reporting) a firstborn girl in any of those states. This result is expected in the case of Kerala, as that state does not suffer from an unnaturally imbalanced child sex ratio, but it is less expected in the case of Punjab, where a problem of 'missing' women does exist (see Table 3.1).

The latter result highlights the relevance of the community gender context, which can be influential in negating or enhancing the effects of individual *progressivity* on well-being outcomes. That is, as this chapter has already pointed out, women in Delhi are collectively more progressive than women in the rest of India, such that the context may further enhance the effect of individual *progressivity*. In contrast, progressive women in Punjab might not find a supportive environment that allows them to turn their progressive thoughts (e.g. defending the life of their daughters) into action.

This does not mean that there are no women with low *progressivity* levels in Delhi. There are (although less than in Punjab (see Figure A3.1)), and that may in fact partly explain why sex-ratios are unbalanced there, but the idea is that women who happen to be progressive enough as to want to keep a girl child, manage to do so because they may not be 'punished' by the community for not having conformed with the patriarchal social norms. This might be true, firstly perhaps because

those rules are less entrenched in people's minds in Delhi; and second, because women there might not be known by the wider community. Therefore, collective action that aims at empowering communities of women (and instilling gender egalitarian thoughts in men) may have more far reaching benefits on reducing gender inequalities, than the increase in *progressivity* of isolated agents.

In this sense, the mass anti-rape protests that have taken place in New Delhi in the last months, and in which large numbers of men have also been taking part, suggest, to some extent, the existance of a more progressive / egalitarian collective consciousness in Delhi, which probably does not exist elsewhere in India. Because of this, equation (3.4) was re-estimated using the *baseline* index, but constraining the sample to women whose husband was interviewed. This was done in order to test the hypothesis that those women were benefiting from a more progressive and supporting family environment, which may then enhance the effect of women's *progressivity* on the probability of having a firstborn girl.

That is, although couples who were interviewed are representative of all couples at the state and national level, that is only in terms of observable characteristics (e.g. age, caste, religion, education, etc.) Nevertheless, those men must have made themselves available to answer a demographic and health survey, which may signal that they conferred importance to it. Those men might thus be more progressive, supportive, and understanding than other husbands, *ceteris paribus*. Such characteristics would allow their wives to enjoy a more progressive, peaceful, and supporting environment at home.

The results in Table A3.10 in the Appendix provide suggestive evidence that something like that may indeed be at play. In particular, the effect of *progressivity* on the probability of reporting a daughter as the first child is almost twice as large as in the baseline specification. More specifically, a one-standard deviation

increase in the women's *progressivity* index is associated with an 11.4-percentage point increase in the likelihood of having (reporting) a female firstborn, compared to women who have not yet given birth.

3.5 Duration from marriage to first birth

3.5.1 Model and estimation

The second outcome under investigation is the duration from marriage to first birth. In particular, a competing risk discrete hazard model was used to investigate the number of months, m, that a woman, i, spends childless nine months after her first marriage (m=9, 10, 11, ...,M). Such a model was needed as the dataset records children's births in months, and women can exit the childless state by either having a boy or a girl. Women who had not yet given birth at the time of the interview, and those who gave birth more than 5 years after their first marriage were coded as censored. That is, the longest duration to exit, M, was fixed at 60 months. The latter was done as long durations might signal infertility, which may be due to successive abortions.

To identify each hazard, the one leading to a boy and the one leading to a girl, enough observations exiting in each period to each of the two destination states are needed. Therefore, several months were merged to obtain a time index t=1,2,...,7 as follows. The first period (t=1) combines months 9, 10 and 11 after marriage (m=9,10,11); t=2 includes months, m, 12 to 15; t=3 stands for m=16,...,20; t=4 for m=21,...,26; t=5 for m=27,...,35; t=6 for m=36,...,60. Finally, the censored observations, where m>60, were coded as t=7.[120] Given this recoding of the

[120]The longest duration to the time of the interview among childless women is 349 months.

duration variable, there are about 15 percent of all observations exiting in each of the first six periods (t=1,...,6), and 10 percent are censored (t=7).

Define T_i as the length of a completed spell (time to first birth) of woman i. This is a discrete non-negative random variable which takes the value of t if the spell ends in the interval $(I_{t-1}, I_t]$ by one of the two destination states, $j \in \{1,2\}$.[121] The discrete time hazard rate $h_{ij}(t)$ for the tth interval thus denotes the conditional probability of woman i transiting from the childless state ($j = 0$) to the destination state $j \in \{1,2\}$ (giving birth to either a boy, j=1 or a girl, j=2) in the tth interval (t=1,...,6) conditional on not having given birth before:

$$h_{ij}(t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = Pr_j(T_i = t|T_i \geq t;\, \tau_{jt},\, x_i,\, progress_i,\, \theta_{ij})$$
$$\forall \quad j = 1, 2 \tag{3.5}$$

Where:

τ_{jt}= Baseline hazard for outcome j, common to all women.

$\mathbf{x}_i$= Woman i's observed characteristics as outlined in Section 3.4.1. That is, age at marriage, age difference between spouses, own and husband's educational attainment, wealth quintile, religion, caste, family structure, and rural residence.

$progress_i$= Woman i's estimated *progressivity* index.

θ_{ij}= Individual random intercept that is allowed to differ across exits $j \in \{1,2\}$.

The hazard rate for an exit at time t to any destination $j \in \{1,2\}$ is the sum of the individual destination specific hazard rates:

$$h_i(t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = \sum_{j=1}^{2} h_{ij}(t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) \tag{3.6}$$

The survival function, the unconditional probability of remaining childless at the

The longest duration to first birth is 199 months, but durations longer than 60 months were coded as censored.

[121] The state in which a woman finds herself is thus indexed by j = 0,1,2; and the subset j = 1,2 are *destination* states.

end of the interval t, is given by the product of the probabilities of remaining in a spell in all previous periods up to t:

$$S_i(t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = \Pr(T_i > t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = \prod_{k=1}^{t}[1 - h_i(k|\tau_{jk},\, x_i,\, progress_i,\, \theta_{ij})] \quad (3.7)$$

The unconditional probability of transition in period t for woman i into the destination state $j\ \epsilon\ \{1,2\}$ is thus given by:

$$Pr_j(T_i = t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = h_{ij}(t|\tau_{jt},\, x_i,\, prgoress_i,\, \theta_{ij}) \prod_{k=1}^{t-1}[1-h_i(k|\tau_{jk},\, x_i,\, progress_i,\, \theta_{ij})]\, \forall j \epsilon\, \{1,2\} \quad (3.8)$$

To account for the competing risk nature of the problem, assume the hazard to be a multinomial logit, where the alternatives are "not yet given birth / censored" (j=0), "firstborn is a boy" (j=1), "firstborn is a girl" (j=2). Taking the first alternative (j=0) as the reference category for identification, the hazard is given by:

$$h_{ij}(t|\tau_{jt},\, x_i,\, progress_i,\, \theta_{ij}) = \frac{\exp(\mathbf{x_i'}\beta_\mathbf{j} + \tau_{jt} + \psi_j progress_i + \theta_{ij})}{1 + \sum_{g=1}^{2} \exp(\mathbf{x_i'}\beta_\mathbf{g} + \tau_{gt} + \psi_g progress_i + \theta_{ig})}\ \forall\, j = 1, 2 \quad (3.9)$$

Given the recoding of the time variable, this is a discrete time, three choice model as each woman will have multiple observations (maximum 7) for the outcome variable. Specifically, the latter will take the value of 0 in all periods starting 9 months after marriage until she gives birth, when it takes the value of either 1 if the offspring is a boy, or 2 if it is a girl.[122] For instance, a woman exiting the childless state 10 months after marriage due to giving birth to a girl will have only one indicator, taking the value of 2. A woman exiting 37 months after marriage to a boy will have 6 observations for the dependent variable, all taking the value of zero except the last one, which will be a 1; and a woman who was interviewed

[122] That is, from the original data, where births were recorded in months m, the discrete variable t (t = 1,...,6) was created as previously explained. From it, the final categorical, outcome variable was created and it can take the values 0,1,2.

22 months after marriage but has not yet given birth will have 4 observations for the outcome variable, all taking the value of 0.

Given a random sample of women and keeping the first alternative (j=0) as the reference category, the sample likelihood function with random intercepts, θ_j,is:

$$L = \int_{-\infty}^{\infty} \prod_{i=1}^{N} \prod_{t=1}^{6} \prod_{j=0}^{2} \left\{ \frac{\exp(\mathbf{x_i'}\beta_\mathbf{j}+\tau_{jt}+\psi_j progress_i+\theta_j)}{1+\sum_{g=1}^{2}\exp(\mathbf{x_i'}\beta_\mathbf{g}+\tau_{gt}+\psi_g progress_i+\theta_g)} \right\}^{d_{ijt}} f(\theta)d\theta$$

$$\forall \; j = 1, 2 \tag{3.10}$$

$$\text{where } d_{ijt} = \begin{cases} 1 & \text{if woman } i \text{ makes transition to destination } j \text{ in period } t \\ 0 & \text{otherwise} \end{cases}$$

The maximization of equation (3.10) was approximated through Gauss-Hermite quadrature using the gllamm routine in Stata under the assumptions that the unobserved heterogeneity θ is identically and independently distributed across individuals, and that it follows some bivariate normal distribution $f(.)$. That is, $\theta = (\theta_1, \theta_2) \sim f\left\{ \begin{pmatrix} a_1 \\ a_2 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\theta_1} & \sigma_{\theta_1\theta_2} \\ \sigma_{\theta_1\theta_2} & \sigma^2_{\theta_2} \end{pmatrix} \right\}$, where θ is assumed to be independent of the included regressors.[123]

3.5.2 Results

Table 3.8 shows the results from estimating the duration model in equation (3.9) using the whole sample of 2032 women in Delhi. Four different specifications were estimated by consecutively adding covariates. Model [1] relates to the univariate model, where the outcome variable (for each woman, a series of up to six zeros, if she has not yet given birth, or zeros followed by either a 1 or a 2 at the time spell of first childbearing) was regressed on the baseline *progressivity* index and a constant only. In that case, a one-standard deviation increase in the *progressivity* index

[123] An approximation was needed as there is no analytical solution for the integral in equation (3.10), as one needs to integrate over the distribution of the unobserved heterogeneity, θ.

is associated with a significant 3.1 percentage-point increase in the probability of exiting the childless state due to giving birth to a girl. By contrast, there is no statistically significant effect on the probability of exiting due to giving birth to a boy.

Model [2] added time spell indicators to the unadjusted model. A one-standard deviation increase in the *progressivity* index is now associated with a significant 13 percentage-point increase in the probability of exiting due to giving birth to a girl. There continues to be no significant effect of *progressivity* on the probability of exiting due to giving birth to a boy. Model [3] extends the model by adding the exogenous covariates $\mathbf{x}$ (as described in both Section 3.4.1 and 3.5.1). In that case, the effect of *progress* is not statistically significant for either gender.

Finally, Model [4] adds interaction terms between *progress* and each of the six time spell indicators. A one-standard deviation increase in the level of *progressivity* is now associated with a 9-percentage point increase in the probability of exiting due to giving birth to a girl in the first time spell (9-11 months after marriage). There is also a large and positive effect on the probability of exiting in later periods due to having a daughter, but the effect is not statistically significant. In contrast, the effect on the probability of exiting in later periods (at least 21 months after marriage) due to giving birth to a son is very large, negative, and significant at the 1 percent level. These results are consistent with more progressive women being less likely to sex-select their first child. That is, under normal conditions one would expect more progressive women to delay the initiation of childbearing, *ceteris paribus*. In a context of very strong son preferences however, long birth intervals might be the result of successive abortions (presumably of female foetuses). Therefore, the fact that each period more progressive women are more likely to exit the childless state by giving birth to a daughter is consistent

with them being less likely to sex-select their firstborn.

In the most complete model, Model [4], we may want to know whether more progressive women are overall more or less likely to exit the childless state. As already discussed, in a context of very strong son preferences, we may see more progressive women exiting earlier for a given baby's gender. On the other hand, if boys' and girls' hazards were compared given a certain *progressivity* level, the boys' hazard should be slightly above that of girls simply because it is (5 percent) more likely to give birth to a boy than to a girl. Finding the opposite might be evidence of sex-selective abortions. That is, girls' hazard may be higher than that of boys because women whose firstborn is female did not have a particular preference for boys, so they did not undergo any abortion and exited the childless state at the normal, natural, pace. In contrast, women with a firstborn male are not only those who had a boy by chance but also those who first aborted a girl / girls and then gave birth to a boy, such that they exited at a rate slower than normal, making the length of intervals leading to a boy longer than normal.

In order to assess these hypotheses, the probability of exiting the childless state by giving birth to a son / daughter (j=1,2) in the tth time spell (t=1,...,6) was calculated for each woman using the estimated parameters and three different values of *progress*. The first one is the "average" *progressivity* level, calculated as the sample mean of *progress,* $\bar{X}_{progress}$. The other two values add / subtract one sample standard deviation to the mean, ($\bar{X}_{progress} \pm s_{progress}$), to obtain the "high" / "low" *progressivity* levels. In each case, the actual values of the other covariates were used. The average of the individual probabilities was then taken and plotted. The resulting hazards are referred as "average", "high", and "low". Figure 3.4 plots the hazards for girls, and Figure 3.5 shows those of boys.[124]

[124]Each hazard is thus based on six average probabilities, and a total of 36 probabilities, P_{jtp}, were estimated for each woman. This is because there are 36 different combinations of

Figure 3.4 shows that, except for t=5 (27-35 months after marriage), the "high" girl hazard is always above the respective "average" one, which is in turn above the respective "low" one. At t=5, the "low" hazard has almost reached its maximum and it is therefore slightly higher than the other two hazards (39 versus 38 and 36 percent probability of having a firstborn daughter). In the final period, t=6 (3-5 years after marriage), the "high" hazard is again at the top and it is there where the largest difference between the three hazards is found. Specifically, whilst the "high" hazard almost achieves the biologically normal sex ratio at birth at that point, with a 48.6 percent probability of having a firstborn daughter, the respective probablities are 44.8 and 40.9 percent if evaluated at the "average" and "low" *progressivity* levels instead. This fact is even more important if one takes into account that at t=6, the probability of being childless is the lowest at the "high" *progressivity* level (4 percent compared to 3 percent at the "low" *progressivity* level). Therefore, there remains less probability to share out between the two destination states (boys and girls) at the "high" *progressivity* level than at the "low" level (96 versus 97 percent) but the girl's share in the total probability is much higher in the former case. These results are consistent with more progressive women not interfering with nature and so, exiting at the normal, natural pace.

Figure 3.5 is also consistent with that hypothesis. At early spells, up to t=4 (26 months after marriage), the average probability of exiting the childless state by giving birth to a son is the highest if evaluated at the "high" *progressivity* level, whilst the "average" hazard is in the middle and the "low" hazard is at the

exiting time spells (t=1,...6), *progressivity* levels (ρ="average"=1, "high"=2, "low"=3), and destination states (j=1=boy, 2=girl). Thus, 6*3*2=36. Each figure $P_{jt\rho}$was calculated using equation (3.9). For instance, P_{231}, the probability of exiting the childless state by giving birth to a daughter, j=2, in the third time spell, t=3, (16-20 months after marriage) calculated at the average *progressivity* level, $\rho = 1$, is: $P_{231} = \frac{\exp\left(\left(\beta_{02}+\delta_{t_32}\right)+\mathbf{x_i'}\beta_{\mathbf{2}}+\left(\psi_2+\delta_{tp_32}\right)\bar{X}_{progress_i}\right)}{1+\sum_{g=1}^{2}\exp\left(\left(\beta_{0g}+\delta_{t_3g}\right)+\mathbf{x_i'}\beta_{\mathbf{g}}+\left(\psi_g+\delta_{tp_3g}\right)\bar{X}_{progress_i}\right)}$

bottom. However, from t=5 (27-35 months after marriage) onwards, the “low” hazard is at the top and the "high" hazard at the bottom. Specifically, in the last period, t=6 (3-5 years after marriage), the average probability of exiting the childless state by giving birth to a boy is 56 percent if evaluated at the "low" *progressivity* level, and 52 and 47 percent if evaluated at the “average”, and “high” level respectively. Like this, as noted earlier, the average probability of having a firstborn girl in the last period is almost at the biologically normal, even when the probability of remaining childless is positive.

Figures 3.6 to 3.8 plot both male and female hazards for the “low”, “average”, and “high” *progressivity* levels respectively. Apart from the “high” hazards (Figure 3.8) in the last period (t=6), the boys’ hazard is always above the respective girls’ hazard. In the case of the “low” and “average” hazards (Figures 3.6 and 3.7 respectively), the largest difference between the boys’ and girls’ hazards occur in the final period (3-5 years after marriage), being 15 and 7 percentage points respectively. These figures are much higher than the biologically normal difference. In contrast, as already mentioned, at t=6 the girls’ hazard evaluated at the “high” *progressivity* level is slightly above the respective hazard for boys. Specifically, at that point there is a 49 percent probability of having a firstborn daughter compared to 47 percent probability of having a firstborn son. Although these differences are not statistically significant, they do point in the right direction (more progressive women being more likely to have a firstborn girl) and as such have economic significance.

3.6 Conclusions

Using a latent factor model this chapter has constructed an index to measure

Indian women's level of *progressivity*. Progressive women are those who decide on their own healthcare, are free to visit the health facility on their own, do not justify wife beating, and think that it is justified to refuse sex to husbands under certain circumstances. The chapter has then assessed the effect of *progressivity* on the sex of the firstborn and on the length of the first birth interval in Delhi, India's National Capital Territory. The latter has, unlike other Indian states / territories, a deficit of girls even among first order births, and a skewed child sex ratio that did not improve between 2001 and 2011, according to census data.

The chapter finds that more progressive women are more likely to have a firstborn daughter. In particular, a one-standard deviation increase in the *progressivity* index is associated with a 5.8-percentage point increase in the likelihood of a firstborn girl relative to women who have not yet given birth. The effect is robust to the set of covariates used to create the index; and it increases for different subsamples, mainly the ones that shorten the period of study to account for the introduction and availability of the ultrasound.

The effect of *progressivity* on the girl equation almost doubles if the sample is restricted to women whose husband was interviewed, who might be more progressive, supportive, and understanding than other husbands, *ceteris paribus*. Furthermore, a simpler alternative index estimated as the arithmetic mean of the four *progressivity* indicators yields a higher impact (8.3 percentage points) on the probability of reporting a female first child. Additionally, more progressive women experience shorter first birth intervals. This, together with the fact that they are more likely to have a firstborn girl, may indicate that they are less inclined to sex-select their first child.

Lastly, the chapter has estimated the firstborn's sex equation for two other Indian states: Kerala and Punjab. *Progressivity* is not found to significantly

affect the sex of the firstborn in any of those two states. This result was expected in the case of Kerala, as that state does not suffer from an imbalanced child sex ratio. As for Punjab, the chapter conteds that that finding, along with the ones in Delhi, can be explained by structural considerations, such that they highlight the importance of the community gender context which can be influential in negating or enhancing the effects of individual-level empowerment on well-being outcomes.

Specifically, the chapter shows that women in Delhi are collectively more progressive than women in the rest of India, such that the context may further enhance the effect of individual *progressivity*. In contrast, progressive women in Punjab might not find a supportive environment that allows them to turn their progressive thoughts (e.g. defending the life of their daughters) into action. This does not mean that there are no women with low *progressivity* levels in Delhi. There are (although less than in Punjab), and that may in part explain why sex-ratios are unbalanced there, but the idea is that women who happen to be progressive enough as to want to keep the baby girl, manage to do so because they may not be 'punished' by the community for not having conformed with the patriarchal social norms.

Larger structural change may thus have more far reaching benefits on reducing gender inequalities, than the increase in *progressivity* of isolated agents. As Kabeer (1999, 457) points out: "in a context where cultural values constrain women's ability to make strategic life choices, structural inequalities cannot be addressed by individuals alone". Women's organizations and social movements may thus be crucial in creating the conditions for change, and in reducing the costs of not conforming to the social norms for individual women. The mass anti-rape protests that have taken place in New Delhi in the last months, and in which large numbers of men have also taken part, suggest that these conditions may, to some extent,

already exist in a fraction of Delhi's society, but perhaps not elsewhere in India.

Indian families tend to prefer boys over girls due in part to economic and cultural reasons, regional governments should thus introduce new, and expand the already existing interventions aimed at subsidising and empowering girls. For instance: (i) given that parents traditionally lose their daughters to in-laws while their sons remain at home and provide for them, a pension for the elderly could be launched; (ii) subsidised education and training for girls could be offered in order to improve their employment prospects and reduce the cost of (theoretically outlawed) dowries; (iii) the whole society should be taught, both in school since early ages and through permanent media campaigns, about women's human rights and gender equality; (iv) crucially, for female foeticide and infanticide to stop, culture has to change such that a massive media campaign could be launched to promote the idea that dowries and son preference are old-fashioned; (v) equal-rights rulings, laws protecting women from violence, and those intended to halt sex-selective abortions should be (passed and) strictly enforced. Such strategies have successfully worked in South Korea, which in the 1990s had a skewed sex-ratio just as India's today, and currently has an almost normal sex ratio at birth.[125]

[125]In 1990, the sex ratio at birth hit 116.9 boys for every 100 girls, the highest in the world at that time. In 2007, the Korean government announced that it had reached normal sex ratios at birth (Hudson and den Boer (2004)), and in 2011 the United States Central Inteligence Agency put that ratio at 107 (US CIA (2013)).

Tables & Figures

Table 3.1: Sex ratios for Indian states / union territories†

Source	Census		Census				NFHS-3		
Sample	Overall pop.		Children aged 0-6 years				First order births		
	Men per 100 women		Boys per 100 girls		Prop. of girls		Proportion of girls		
State	2001	2011	2001	2011	2001	2011	N	Female	P-value
Jammu&K	112	113	106	116	0.485	0.462	1851	0.493	0.65
Himachal P	103	103	112	110	0.473	0.475	2097	0.499	0.32
Punjab	114	112	125	118	0.444	0.458	2440	0.469	0.06
Uttaranchal	104	104	110	113	0.476	0.470	1913	0.492	0.70
Haryana	116	114	122	120	0.450	0.454	1922	0.502	0.22
Delhi	122	115	115	115	0.465	0.464	2189	0.462	**0.01**
Rajasthan	109	108	110	113	0.476	0.469	2648	0.464	0.01
Uttar P	111	110	109	111	0.478	0.473	7928	0.483	0.41
Bihar	109	109	106	107	0.485	0.483	2478	0.490	0.82
Sikkim	114	112	104	106	0.491	0.486	1252	0.462	0.06
Arunachal P	112	109	104	104	0.491	0.490	1057	0.459	0.06
Nagaland	111	107	104	106	0.491	0.486	2285	0.498	0.32
Manipur	103	101	104	107	0.489	0.483	2593	0.487	0.93
Mizoram	107	103	104	103	0.491	0.493	1108	0.458	0.04
Tripura	105	104	104	105	0.491	0.488	1248	0.486	0.91
Meghalaya	103	101	103	103	0.493	0.492	1228	0.485	0.81
Assam	107	105	104	104	0.491	0.489	2487	0.484	0.70
West Bengal	107	106	104	105	0.490	0.487	4552	0.491	0.71
Jharkhand	106	106	104	106	0.491	0.485	2030	0.496	0.50
Orissa	103	102	105	107	0.488	0.483	2931	0.481	0.48
Chhatisgarh	101	101	103	104	0.494	0.491	2516	0.483	0.64
Madhya P	109	108	107	110	0.482	0.477	4416	0.482	0.42
Gujarat	109	109	113	113	0.469	0.470	2534	0.485	0.73
Maharashtra	108	108	110	113	0.477	0.469	5981	0.493	0.45
Andhra P	102	101	104	106	0.490	0.485	4791	0.478	0.16
Karnataka	104	103	106	106	0.486	0.485	4008	0.493	0.51
Goa	104	103	107	109	0.484	0.479	1849	0.473	0.20
Kerala	95	92	104	104	0.490	0.490	2318	0.491	0.81
Tamil Nadu	101	101	106	106	0.485	0.486	4024	0.493	0.50
India	107	106	108	109	0.481	0.478	80674	0.485	**0.07**

†Source: Own calculation using census data, where sex ratios are given as the number of females for every 1000 males, and the NFHS-3. In the latter case, the sample includes ever married women who are usual residents in the state where they were interviewed and whose first child was a singleton. P-value for the test: $H_0 : \Pi = .488\, v\, H_1 : \Pi \neq .488$, where 0.488 is the biollogically normal proportion of females at birth. In the first column, P stands for *pradesh*, which means province in Hindi.

Table 3.2: Descriptive Statistics: Sample means (s.d.)†

Variable	Urban	Rural	Delhi
Age at marriage	18.82	17.31	18.49
	(4.10)	(3.63)	(3.74)
Current age	33.01	31.79	33.01
	(8.10)	(8.51)	(7.95)
Age difference between spouses (husband-wife)			
[Difference -2 to 5 years]	0.55	0.56	0.72
Wife 2+ years older than husband	0.01	0.01	0.00
Husband 6+ years older than wife	0.44	0.43	0.28
Highest Education			
[None / incomplete primary]	0.31	0.61	0.34
Completed primary	0.06	0.07	0.06
Some secondary	0.38	0.26	0.28
Completed secondary	0.24	0.05	0.32
Caste			
[Normal / no answer / missing]	0.47	0.32	0.64
Scheduled caste	0.16	0.18	0.21
Scheduled tribe	0.07	0.17	0.01
Other backward caste	0.31	0.33	0.14
Religion			
[Hindu]	0.72	0.76	0.86
Muslim	0.16	0.11	0.09
Christian	0.07	0.08	0.01
Sikh	0.01	0.03	0.03
Budhist	0.01	0.01	0.00
Other religion / none / no answer	0.02	0.02	0.01
Wealth quintile			
[Poorest]	0.02	0.21	0.00
Poor	0.05	0.23	0.03
Middle	0.12	0.24	0.12
Richer	0.28	0.20	0.19
Richest	0.53	0.12	0.66
Family structure [Extended]			
Nuclear family	0.56	0.51	0.58
Media contact [No contact / no answer]			
Reads newspaper	0.55	0.25	0.54
Listens to the radio	0.46	0.43	0.59
Watches TV	0.90	0.57	0.91
Place of residence [Urban]			
Rural			0.07

Table 3.2: Continued: Descriptive Statistics†

Variable	Urban	Rural	Delhi
State of residence			
Jammu and Kashmir	0.02	0.03	
Himachal Pradesh	0.02	0.03	
Punjab	0.02	0.03	
Uttaranchal	0.02	0.03	
Haryana	0.01	0.03	
Delhi	0.06	0.00	
Rajasthan	0.03	0.04	
Uttar Pradesh [Base, rural sample]	0.09	0.11	
Bihar	0.03	0.04	
Sikkim	0.01	0.02	
Arunachal Pradesh	0.01	0.02	
Nagaland	0.03	0.02	
Manipur	0.03	0.03	
Mizoram	0.01	0.01	
Tripura	0.01	0.02	
Meghalaya	0.01	0.02	
Assam	0.02	0.04	
West Bengal	0.06	0.05	
Jharkhand	0.02	0.03	
Orissa	0.02	0.05	
Chhatisgarh	0.02	0.04	
Madhya Pradesh	0.06	0.05	
Gujarat	0.03	0.03	
Maharashtra [Base, urban sample]	0.11	0.04	
Andhra Pradesh	0.08	0.04	
Karnataka	0.04	0.05	
Goa	0.03	0.02	
Kerala	0.02	0.03	
Tamil Nadu	0.06	0.04	
N (total=83556)	36795	46761	2032

†Source: NHFS-3 (2005-2006). The sample includes currently married women who are usual residents in the state where they were interviewed. The sum of individual proportions may add up to more / less than 1 due to rounding. Base category in square brackets.

Table 3.3: Descriptive Statistics: Means of *progressivity* measurements†

Variable	Urban	Rural	Delhi
ω_1 : Decides on her own healthcare	0.31	0.27	0.35
ω_2 : Allowed alone to the health clinic	0.67	0.5	0.73
ω_3 : Wife beating is not justified	0.53	0.37	0.62
ω_4 : Refusing sex to husband is justified	0.76	0.68	0.77
N (total = 83556)	36795	46761	2032

†Source: Own calculation using data from the NHFS-3 (2005-2006). The sample includes currently married women who are usual residents in the state where they were interviewed. Each measurement takes the value of either 0 or 1, so the means are the proportion of women answering 'yes' to each question. The urban and rural subsamples include all women in India.

Table 3.4: Estimation Results - Equation (3.1)†

Intercepts (λ_{0q})	Urban	Rural
Constant	-1.185***	-1.676***
	(0.034)	(0.032)
ω_1 : Decides own healthcare	Base	Base
ω_2 : Allowed alone to the health clinic	1.027***	-6.041***
	(0.051)	(0.556)
ω_3 : Wife beating not justified	-1.003***	1.100***
	(0.114)	(0.035)
ω_4 : Refusing sex justified	1.386***	2.224***
	(0.054)	(0.033)
Slopes (Factor Loadings (λ_{1q}))		
ω_1 : Decides own healthcare	1	1
ω_2 : Allowed alone to the health clinic	2.628***	12.79***
	(0.185)	(1.012)
ω_3 : Wife beating not justified	6.706***	0.099***
	(0.500)	(0.026)
ω_4 :Refusing sex justified	2.993***	0.339***
	(0.226)	(0.028)
Variance of the *progressivity* trait	0.019***	0.17***
	(0.003)	(0.011)

†Standard errors in parentheses. Asterisks denote the significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01.

Table 3.5: Estimation Results - Equation (3.2)†

Variable	Urban	Rural
Age at marriage	0.002***	-0.003***
	(0.001)	(0.001)
Current age	0.004***	0.014***
	(0.000)	(0.001)
Age difference between spouses (husband-wife) [-2 to 5 years]		
Wife is 2+ years older than husband	-0.039**	-0.066***
	(0.019)	(.023)
Husband 6+ years older than wife	-0.001	0.008
	(0.004)	(.006)
Highest Education [None / incomplete primary]		
Completed primary	0.026***	-0.017
	(0.008)	(.011)
Some secondary	0.061***	0.024***
	(.007)	(.009)
Completed secondary	0.165***	0.134***
	(0.013)	(.017)
Caste ['Normal']		
Scheduled caste	-0.041***	0.026***
	(.006)	(.009)
Scheduled tribe	-0.025**	0.003
	(0.010)	(.010)
Other backward caste	-0.032***	-0.008
	(.005)	(.007)
Religion [Hindu]		
Muslim	-0.026***	-0.071***
	(0.005)	(.010)
Christian	0.048***	0.075***
	(.010)	(.015)
Sikh	0.039**	0.012
	(0.017)	(.026)
Budhist	-0.013	0.113***
	(0.015)	(.029)
Other religion / none / no answer	0.042***	0.191***
	(0.015)	(.024)
Wealth quintile [Poorest]		
Poor	0.029*	-0.013
	(.015)	(0.008)
Middle	0.050***	-0.010
	(0.014)	(0.009)
Richer	0.065***	-0.025**
	(0.014)	(0.011)

Table 3.5: Continued: Estimation Results - Equation (3.2)†

Variable	Urban	Rural
Wealth quintile [Poorest]		
Richest	0.104***	-0.001
	(0.016)	(0.014)
Family structure [Extended]		
Nuclear family	0.021***	0.105***
	(0.004)	(0.006)
Media contact [No contact / no answer]		
Reads newspaper	0.038***	0.059***
	(.006)	(0.009)
Listens to the radio	0.009**	0.014**
	(.004)	(0.006)
Watches TV	0.026***	0.076***
	(0.006)	(0.007)
State of residence [Urban: Maharashtra][Rural: Uttar Pradesh]		
Jammu and Kashmir	-0.053***	0.298***
	(0.015)	(-0.020)
Himachal Pradesh	0.202***	0.403***
	(-0.022)	(-0.021)
Punjab	-0.068***	0.072***
	(-0.014)	(-0.024)
Uttaranchal	0.011	0.119***
	(-0.015)	(-0.018)
Haryana	0.026*	0.076***
	(-0.016)	(-0.018)
Delhi	0.042***	0.260***
	(-0.010)	(-0.047)
Rajasthan	0.069***	0.059***
	(0.013)	(0.015)
Uttar Pradesh	0.128***	
	(0.011)	
Bihar	0.012	-0.002
	(0.012)	(0.016)
Sikkim	-0.046***	0.438***
	(0.016)	(0.028)
Arunachal Pradesh	-0.126***	0.139***
	(0.022)	(0.025)
Nagaland	-0.348***	-0.180***
	(0.029)	(0.025)
Manipur	-0.276***	0.176***
	(0.023)	(0.020)

Table 3.5: Continued: Estimation Results - Equation (3.2)†

Variable	Urban	Rural
Mizoram	-0.255***	0.683***
	(0.025)	(0.042)
Tripura	-0.044**	0.064***
	(0.020)	(0.019)
Meghalaya	-0.147***	0.226***
	(0.021)	(0.028)
Assam	-0.021	0.000
	(0.013)	(0.016)
West Bengal	0.148***	0.060***
	(0.013)	(0.014)
Jharkhand	0.135***	0.048***
	(0.016)	(0.017)
Orissa	-0.071***	-0.229***
	(0.014)	(0.017)
Chhatisgarh	0.144***	-0.067***
	(0.016)	(0.017)
Madhya Pradesh	0.152***	-0.012
	(0.013)	(0.014)
Gujarat	-0.047***	0.106***
	(0.011)	(0.017)
Maharashtra		0.127***
		(0.016)
Andhra Pradesh	-0.106***	-0.023
	(0.011)	(0.015)
Karnataka	-0.106***	-0.038***
	(0.013)	(0.014)
Goa	-0.026**	0.249***
	(0.012)	(0.023)
Kerala	-0.227***	0.091***
	(0.020)	(0.018)
Tamil Nadu	-0.120***	0.325***
	(0.012)	(0.018)
Log-Likelihood	-86336.111	-115293.36
N	36795	46761

†Base category in square brackets. Standard errors in parentheses. Asterisks denote the significance level (double sided): * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 3.6: Estimation Results - Firstborn's gender (Equation (3.4))†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	1.338***	1.411***	0.029	0.058**
	(0.222)	(0.221)	(0.029)	(0.029)
Age at marriage	-0.166***	-0.169***	-0.005	-0.006
	(0.033)	(0.033)	(0.004)	(0.004)
Age difference	-0.015	-0.003	-0.003	0.002
	(0.032)	(0.032)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.355	-0.393	-0.004	-0.020
	(0.295)	(0.298)	(0.034)	(0.034)
Woman: Completed secondary	-1.263***	-1.144***	-0.068	-0.008
	(0.422)	(0.425)	(0.051)	(0.051)
Husband: Completed primary	0.199	-0.019	0.054	-0.048
	(0.295)	(0.297)	(0.034)	(0.033)
Husband: Completed secondary	0.283	-0.034	0.078*	-0.069
	(0.380)	(0.383)	(0.044)	(0.044)
Caste [None]				
Scheduled caste / tribe	0.620**	0.648**	0.015	0.025
	(0.279)	(0.281)	(0.031)	(0.031)
Other backward caste	0.226	0.165	0.021	-0.008
	(0.277)	(0.281)	(0.035)	(0.035)
No sikh / hindu	0.006	0.038	-0.007	0.008
	(0.308)	(0.311)	(0.038)	(0.038)
Wealth quintile [Richest]				
Less than richer	0.496	0.265	0.067	-0.042
	(0.370)	(0.375)	(0.043)	(0.043)
Richer	0.384	0.293	0.033	-0.011
	(0.306)	(0.309)	(0.036)	(0.036)
Nuclear family	0.357*	0.454**	-0.009	0.035
	(0.198)	(0.200)	(0.024)	(0.024)
Rural household	-0.603	-0.338	-0.078	0.047
	(0.367)	(0.367)	(0.058)	(0.057)
Rural*Progress	-0.514	-0.556	-0.008	-0.026
	(0.419)	(0.419)	(0.057)	(0.056)
Constant	4.690***	4.679***		
	(0.721)	(0.726)		
Log-Likelihood	-1767.0283			
N	2032			

†This is the baseline specification: it includes all women in the sample and the baseline *progressivity* index (see Section 3.3.2). Base category in square brackets. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). * p<0.1, ** p<0.05, *** p<0.01.

Table 3.7: Results summary: Effect of *progressivity* on the firstborn's gender†

Model	Coefficient Estimates		Marginal Effects		Log-Likelihood	N
	Boys	Girls	Boys	Girls		
[1]	1.338***	1.411***	0.029	0.058**	-1767.0283	2032
	(0.222)	(0.221)	(0.029)	(0.029)		
[2]	1.359***	1.420 ***	0.035	0.059**	-1679.0818	1912
	(0.220)	(0.221)	(0.030)	(0.030)		
[3]	1.453***	1.495***	0.040	0.054**	-1761.7118	2032
	(0.210)	(0.208)	(0.027)	(0.027)		
[4]	0.958***	1.124***	0.005	0.076**	-1394.4039	1543
	(0.256)	(0.255)	(0.034)	(0.034)		
[5]	0.630**	0.803***	0.010	0.077*	-819.15234	841
	(0.296)	(0.296)	(0.049)	(0.047)		

† [1] Is the baseline specification. It includes all women in the sample (the baseline sample) and controls for all covariates as detailed in Section 3.4.1 and the baseline *progressivity* index. That is, the one estimated using all covariates as detailed in Section 3.3.2. [2] Uses only the subsample of women who are either censored or whose firstborn is still alive. [3] Uses the baseline sample and a *progressivity* index estimated using only "hard" covariates. That is: age at marriage, current age, age difference between spouses, education, religion, caste, and state indicators. [4] Uses only the post-ultrasound sample. That is, women who married in or after 1985. [5] Uses only the sample of women who married when the ultrasound was widely available. That is, in or after 1994. Standard errors in parentheses (bootstrapped (1000 reps.) in the case of *progress*). Asterisks denote the significance level (double sided): * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 3.8: Duration to first birth: Univariate model†

	[1]			
	Coefficient Estimates		Marginal Effects	
	Boys	Girls	Boys	Girls
Progress	0.178***	0.264***	-0.004	0.031**
	(0.039)	(0.043)	(0.013)	(0.013)
RE	-0.006	2.20e-08		
	(0.043)	(1.50e-07)		
corr.	-1			
logL	-5289.1085			
N	2032			

†Robust standard errors for cluster-correlated data (White / Huber / sandwich estimator) in parentheses. Asterisks denote the significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01

Table 3.8: Continued - Duration to first birth: Multivariate models†

	[2]				[3]			
	Coefficient Estimates		Marginal Effects		Coefficient Estimates		Marginal Effects	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Prog.	0.614***	1.003***	-0.029	0.130***	0.203	0.266	0.002	0.027
	(0.0831)	(0.217)	(0.036)	(0.048)	(0.172)	(0.237)	(0.033)	(0.041)
Time spell indicators								
t=2	0.907***	1.632**	-0.070	0.228*	1.407***	2.206***	-0.049	0.275*
	(0.159)	(0.459)	(0.098)	(0.119)	(0.410)	(0.589)	(0.140)	(0.153)
t=3	1.573***	2.692***	-0.096	0.362*	2.417***	3.652***	-0.060	0.440*
	(0.193)	(0.715)	(0.151)	(0.185)	(0.636)	(0.918)	(0.216)	(0.237)
t=4	2.432***	3.992***	-0.117	0.519**	3.646***	5.348***	-0.061	0.625**
	(0.226)	(0.966)	(0.196)	(0.245)	(0.901)	(1.249)	(0.292)	(0.318)
t=5	3.626***	5.677***	-0.125	0.707**	5.231***	7.443***	-0.046	0.841**
	(0.288)	(1.237)	(0.254)	(0.316)	(1.184)	(1.611)	(0.377)	(0.410)
t=6	5.391***	7.794***	-0.070	0.897**	7.457***	10.027***	0.039	1.059**
	(0.362)	(1.552)	(0.321)	(0.398)	(1.477)	(2.008)	(0.472)	(0.512)
Covariates **x**	No				Yes			
RE	2.161***	1.982***			2.961***	1.71***		
	(0.193)	(0.287)			(0.661)	(0.435)		
corr.	.808				.910			
logL	-4991.7796				-4924.899			
N	2032				2032			

†The equivalence between the time spell indicators (t) and the number of months between marriage and first birth (m) is: t=1 refers to m=9-11; t=2 to m=12-15; t=3 to m=16-20; t=4 to m=21-26; t=5 to m=27-35; and t=6 to m=36-60. Observations having m>60 were coded as censored. Model [3] controls for age at marriage, age difference between spouses, woman's and partner's education, caste, religion, wealth quintile, co-residence with in-laws, and rural residence (see Table A3.11 in the Appendix). Robust standard errors for cluster-correlated data (White / Huber / sandwich estimator) in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01.

Table 3.8: Continued - Duration to first birth: Final model†

	[4]			
	Coefficient Estimates		Marginal Effects††	
	Boys	Girls	Boys	Girls
Progress: exit period				
t=1	0.311	0.609**	-0.033	0.090*
	(0.269)	(0.302)	(0.049)	(0.053)
t=2	-0.136	-0.484**	0.082	0.139
	(0.204)	(0.230)	(0.162)	(0.185)
t=3	0.034	-0.310	-0.329	0.207
	(0.231)	(0.242)	(0.225)	(0.294)
t=4	0.004	-0.327	-0.874***	0.302
	(0.239)	(0.260)	(0.292)	(0.393)
t=5	-0.554**	-0.872***	-1.638***	0.417
	(0.246)	(0.285)	(0.385)	(0.500)
t=6	-0.671**	-0.756**	-2.556***	0.534
	(0.270)	(0.301)	(0.498)	(0.626)
Time spell indicators				
t=2	1.721***	2.046***	0.021	-0.002
	(0.449)	(0.756)	(0.047)	(0.050)
t=3	2.803***	3.124***	0.032	0.009
	(0.659)	(1.176)	(0.051)	(0.051)
t=4	4.192***	4.562***	0.027	0.011
	(0.883)	(1.573)	(0.050)	(0.052)
t=5	6.102***	6.533***	-0.013	-0.019
	(1.175)	(2.044)	(0.048)	(0.046)
t=6	8.525***	8.750***	-0.063	0.030
	(1.463)	(2.567)	(0.051)	(0.047)
RE	3.313***	1.015		
	(0.635)	(1.009)		
corr.	.953			
logL	-4913.043			
N	2032			

†The equivalence between the time spell indicators, t, and the number of months between marriage and first birth, m, is: t=1 refers to m=9-11; t=2 to m=12-15; t=3 to m=16-20; t=4 to m=21-26; t=5 to m=27-35; and t=6 to m=36-60. Observations having m>60 were coded as censored. The model also controls for age at marriage, age difference between spouses, woman's and partner's education, caste, religion, wealth quintile, co-residence with in-laws, and rural residence. Those results are shown in Table A3.12 in the Appendix. Robust standard errors for cluster-correlated data (White / Huber / sandwich estimator) in parentheses. Asterisks denote the significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01. †† The marginal effects under "Progress: exit period" refer to the *progressivity* index in the specific exit time period and were calculated adding up the point estimate from the index on its own and the one from the interaction of the index and the relevant time spell indicator.

Path Diagram 3.1: Relationship between latent factor model and outcome model

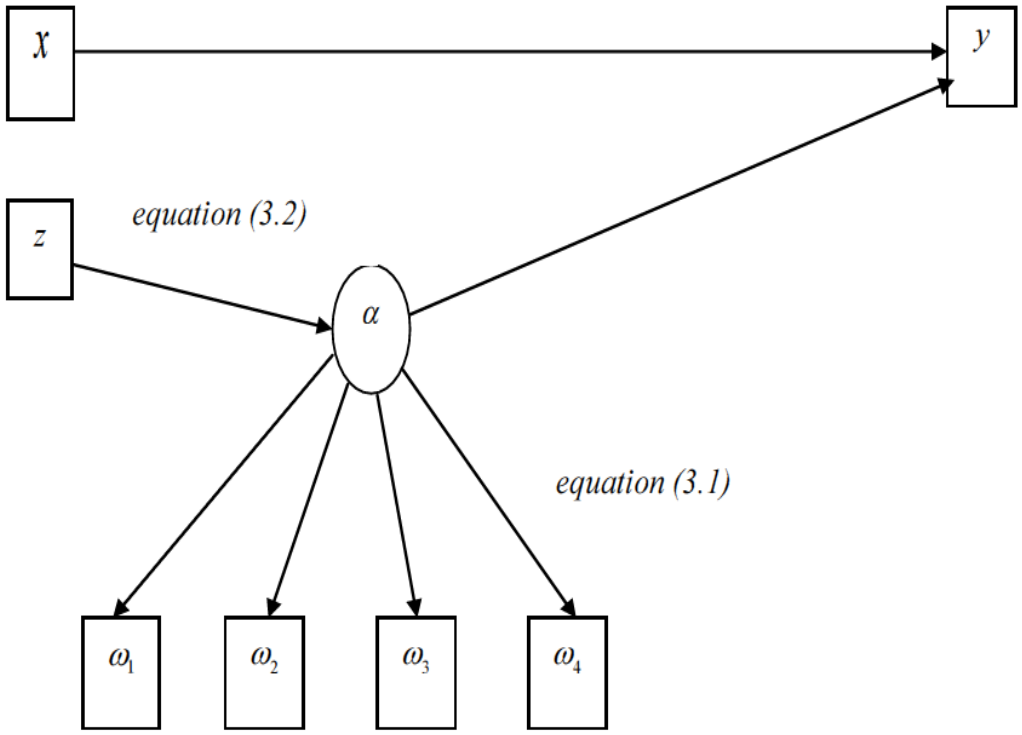


Figure 3.1: *Progressivity* index: Delhi versus whole of India

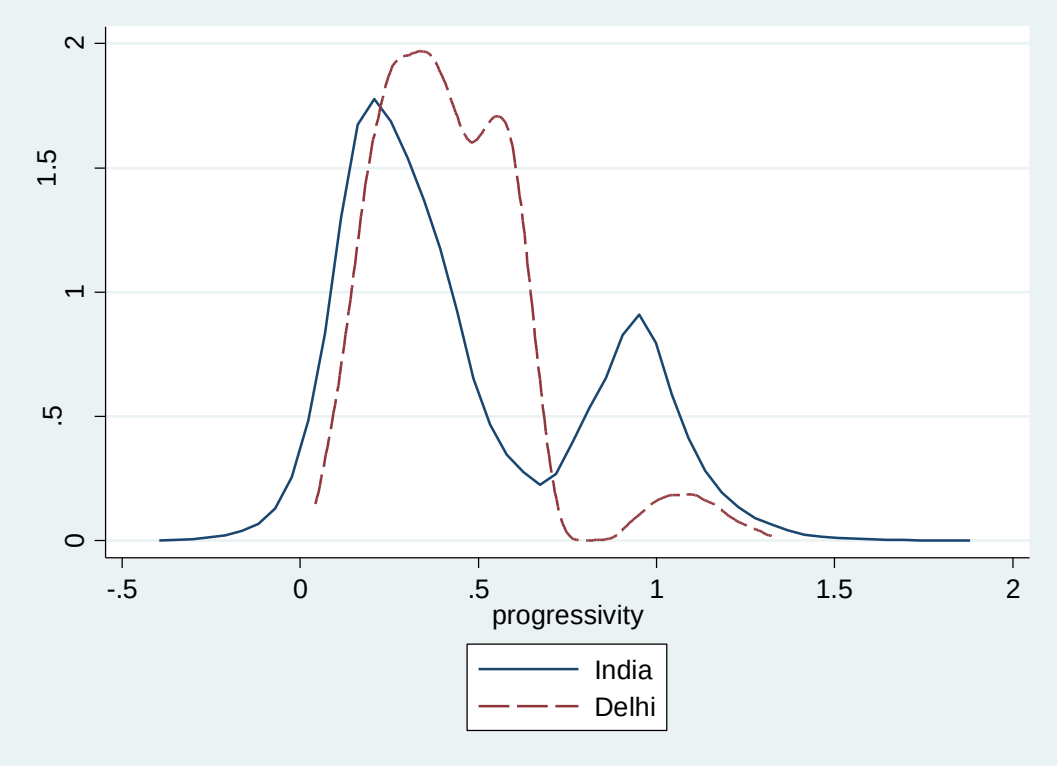
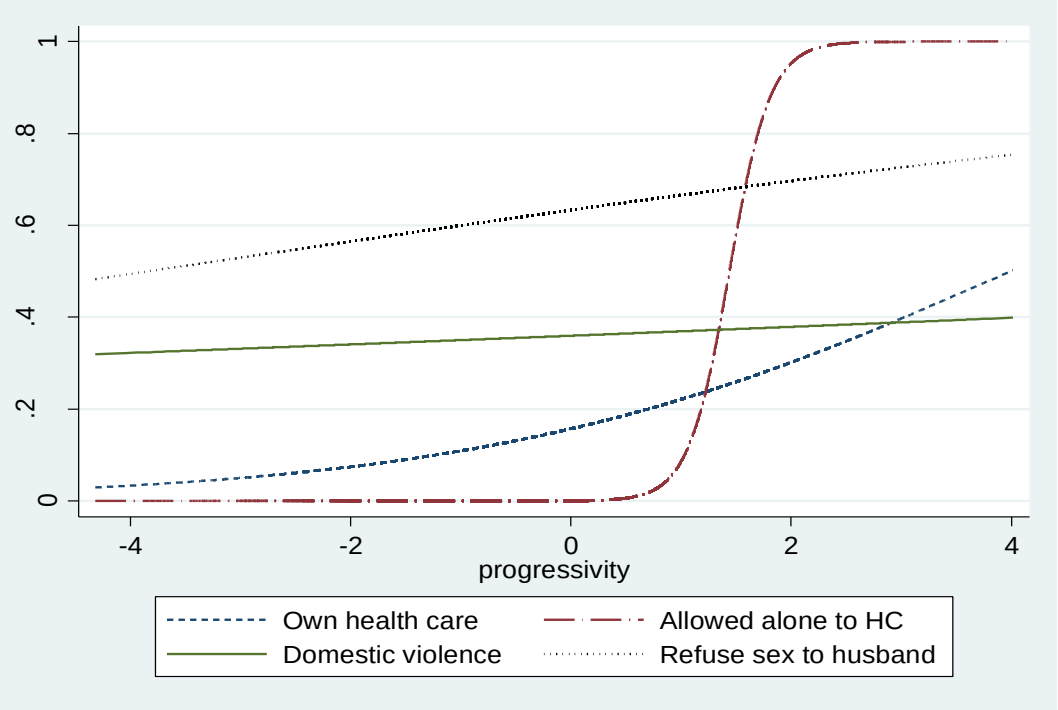
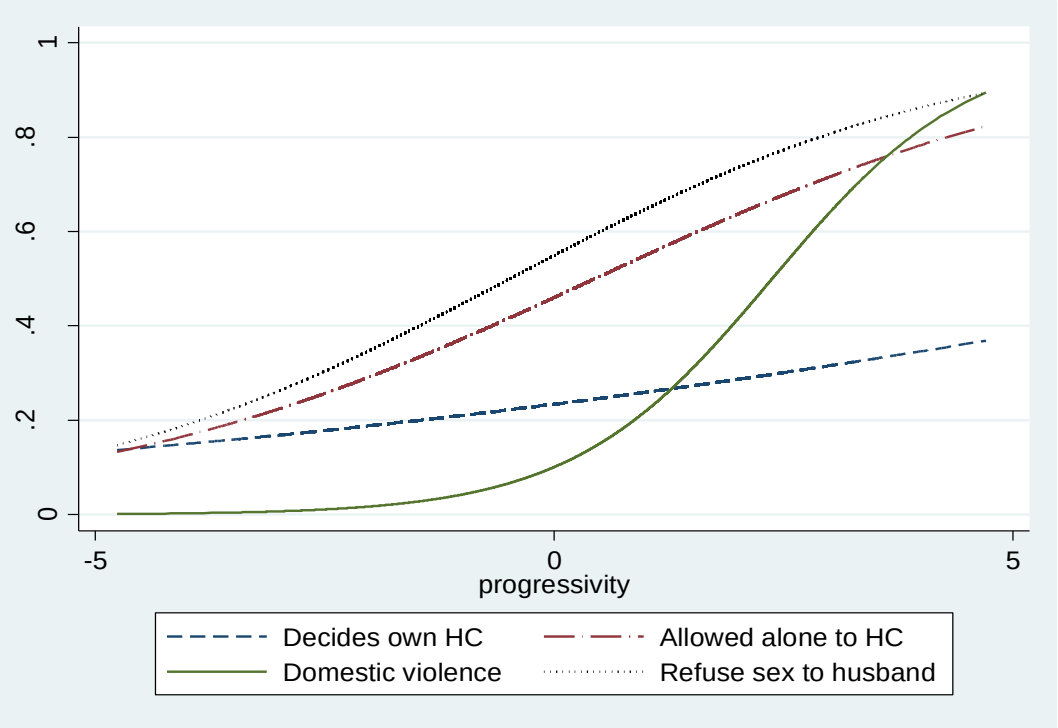


Figure 3.2: Predicted probabilities - Rural sample[†]



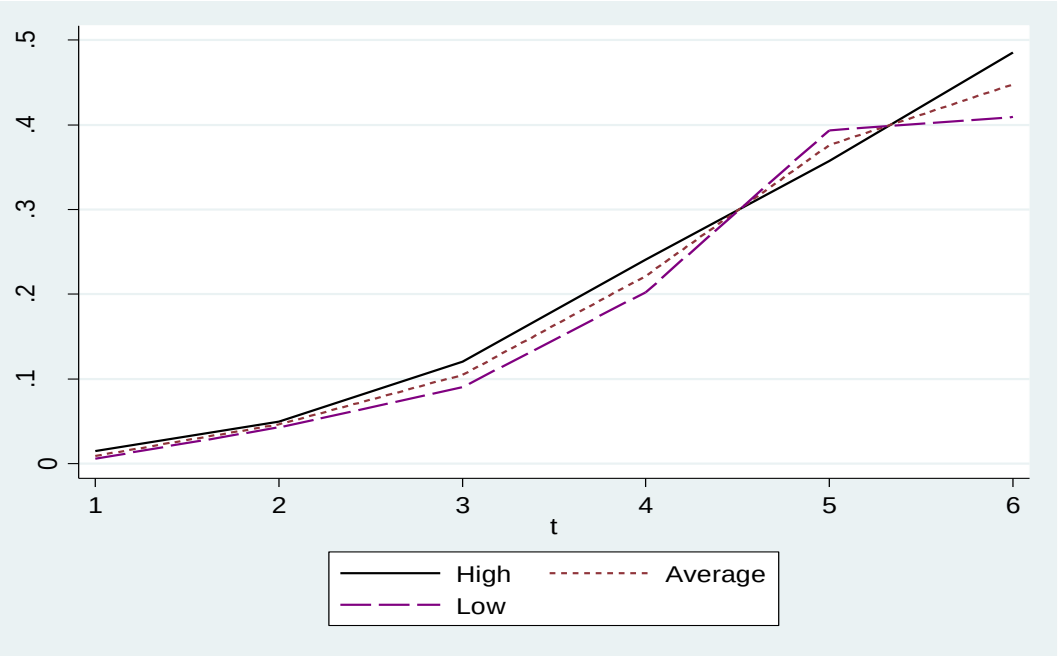
[†]Probabilities obtained using the estimated intercepts and factor loadings in Table 3.4 (3rd column)

Figure 3.3: Predicted probabilities - Urban sample[†]



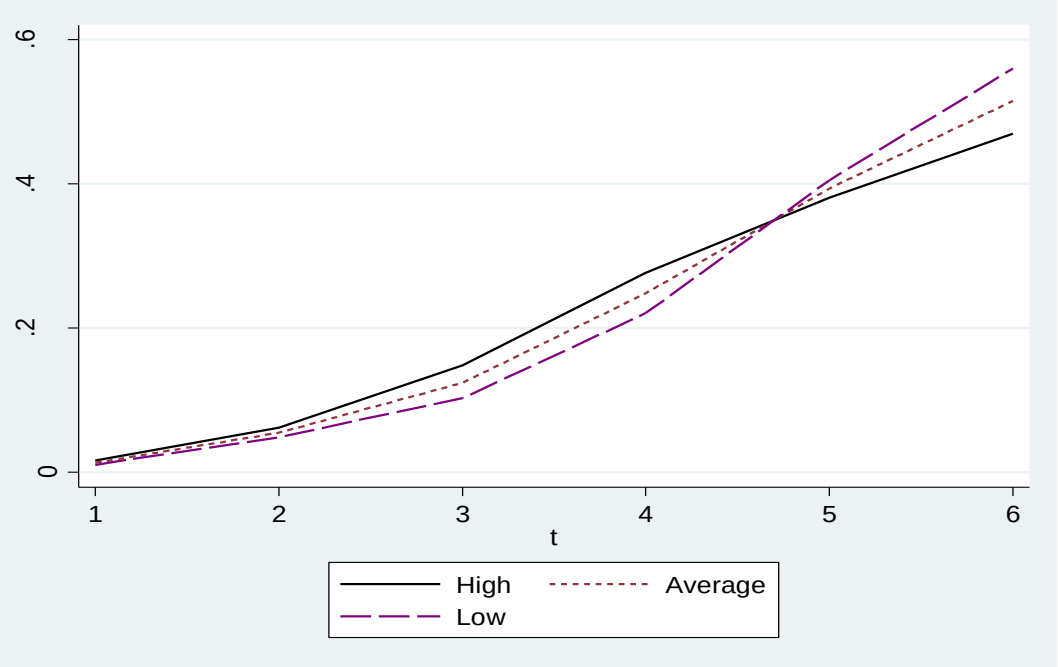
[†]Probabilities obtained using the estimated intercepts and factor loadings in Table 3.4 (2nd column)

Figure 3.4: Predicted hazard for firstborn girls by level of *progressivity*[†]



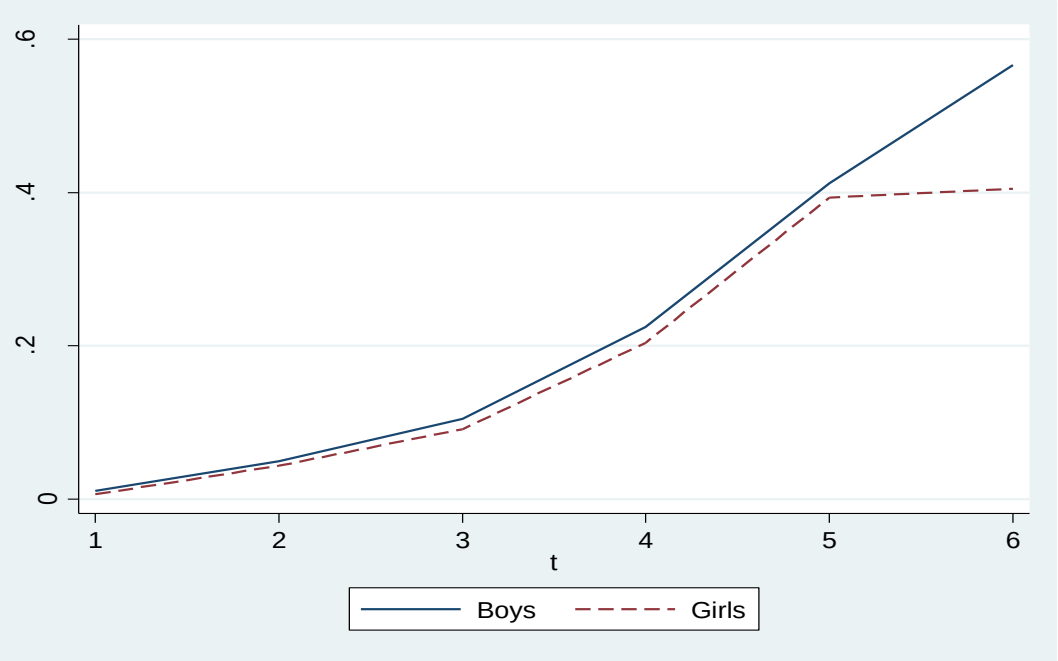
[†]In terms of months after marriage, *m*, the time spell indicators, *t*, are as follows. *t*=1 refers to *m*=9-11; t=2 to *m*=12-15; *t*=3 to *m*=16-20; *t*=4 to *m*=21-26; t=5 to *m*=27-35; and *t*=6 to *m*=36-60. Observations having *m*>60 were coded as censored.

Figure 3.5: Predicted hazard for firstborn boys by level of *progressivity*[†]



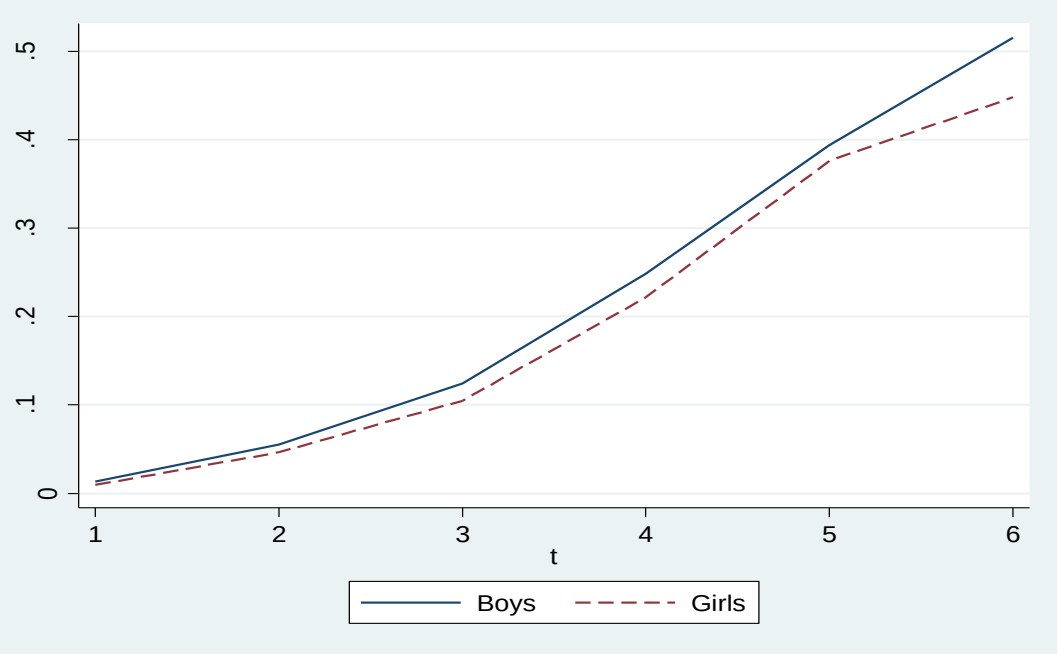
[†]In terms of months after marriage, *m*, the time spell indicators, *t*, are as follows. *t*=1 refers to *m*=9-11; t=2 to *m*=12-15; *t*=3 to *m*=16-20; *t*=4 to *m*=21-26; t=5 to *m*=27-35; and *t*=6 to *m*=36-60. Observations having *m*>60 were coded as censored.

Figure 3.6: Predicted hazard for firstborns at one-standard deviation lower than the average *progressivity* level[†]



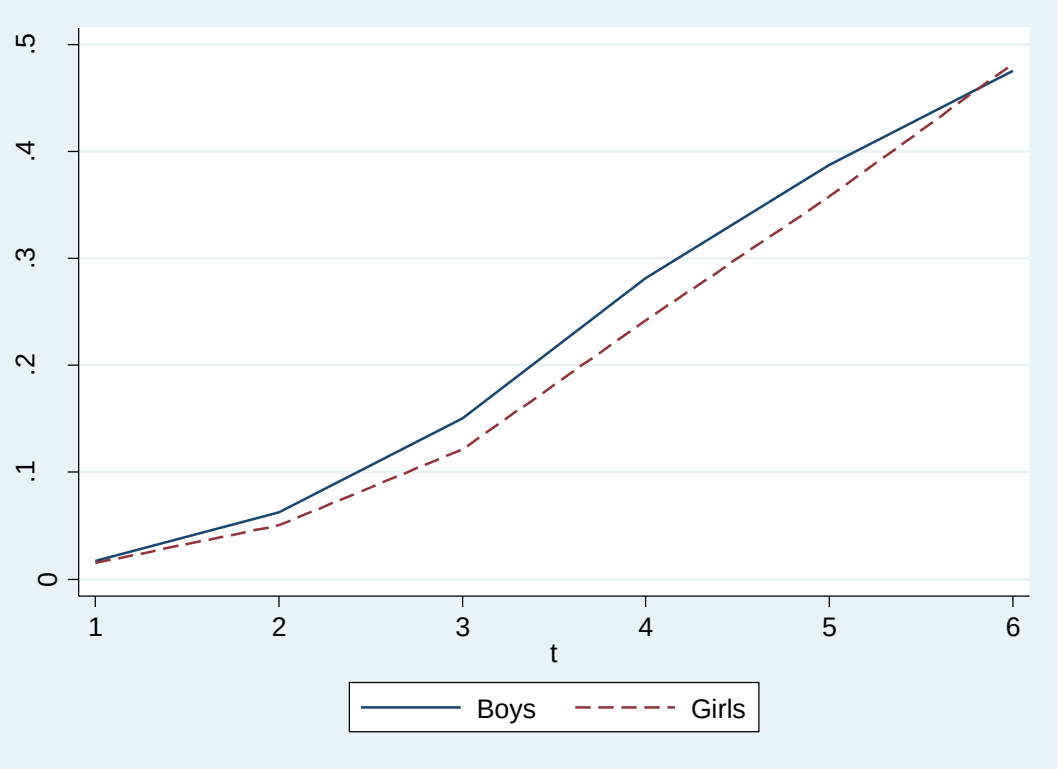
[†]In terms of months after marriage, *m*, the time spell indicators, *t*, are as follows. *t*=1 refers to *m*=9-11; t=2 to *m*=12-15; *t*=3 to *m*=16-20; *t*=4 to *m*=21-26; t=5 to *m*=27-35; and *t*=6 to *m*=36-60. Observations having *m*>60 were coded as censored.

Figure 3.7: Predicted hazard for firstborns at the average *progressivity* level[†]



[†]In terms of months after marriage, *m*, the time spell indicators, *t*, are as follows. *t*=1 refers to *m*=9-11; t=2 to *m*=12-15; *t*=3 to *m*=16-20; *t*=4 to *m*=21-26; t=5 to *m*=27-35; and *t*=6 to *m*=36-60. Observations having *m*>60 were coded as censored.

Figure 3.8: Predicted hazard for firstborns at one-standard deviation higher than the average *progressivity* level[†]



[†]In terms of months after marriage, *m*, the time spell indicators, *t*, are as follows. *t*=1 refers to *m*=9-11; t=2 to *m*=12-15; *t*=3 to *m*=16-20; *t*=4 to *m*=21-26; t=5 to *m*=27-35; and *t*=6 to *m*=36-60. Observations having *m*>60 were coded as censored.

Appendix

A Questions used for the construction of the *progressivity* index.

1. Who usually makes the following decisions: mainly you, mainly your husband, you and your husband jointly, or someone else?

a. Decisions about healthcare for yourself?

2. Are you usually allowed (by your husband) to go to the following places alone, only with someone else, or not at all?

a. To the health facility?

3. Sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations: [Response options: Yes / No / Do not know]

a. If she goes out without telling him?

b. If she neglects the house or the children?

c. If she argues with him?

d. If she refuses to have sex with him?

e. If she does not cook food properly?

f. If he suspects her of being unfaithful?

g. If she shows disrespect for in-laws?

4. Please tell me if you think a wife is justified in refusing to have sex with her husband when:

a. She knows her husband has a sexually transmitted disease.

b. She knows her husband has sex with other women.

c. She is tired or not in the mood.

B Tables & Figures

Table A2.1: Chapter 2: Definition of Variables†

Variable name	Definitions
Dependent variables	
birthwe	Birthweight in grams (babies born between 1997-2003)
treatint	Number of months between program enrolment and date of birth for beneficiary births
Program indicator variables	
beneficiary	1 if birth occurred 2+ months after household enrolled in *Oportunidades* and before it withdrew from it
hh2	1 if household has 2+ members who gave birth (97-2003)
add_mem_benef	*beneficiary*hh2*
Maternal and infant characteristics	
Birth order	
firstbir	1 if the baby is the first birth to her mother
second	1 if the baby is the second birth
third	1 if the baby is the third birth
Sex - female	1 if the baby is female
daysafwe	Number of days after birth when the baby was weighed
Maternal age	
young	Aged less than 20 years
old	Aged more than 34 years
smoked	1 if the mother smoked during pregnancy
Prenatal care quality index	
qualindex	0-1: Either a physician or a nurse undertook the check-up; the mother was weighed; her uterus was measured
Household characteristics before the program's inception	
indig	1 if the household head speaks an indigenous language
Household head's education	
edu6head	1 if 1-6 years of education
edplushead	1 if 6+ years of education
agehead	Household head's age
famsize	Household size
propage5	Proportion of household members aged 0-5 years old
prage6_17	Proportion of household members aged 6-17 years old
Asset index	
econindex	0-1: The dwelling has water and electricity; a fridge and a gas stove; its floor is covered; the household owns agricultural land
Locality Characteristics	
altitude	Locality's altitude in meters

†Sources: Fertility survey (maternal and infant variables), *ENCASEH* (household variables), 2005 short census (altitude), Transfers Database and socioeconomic *ENCEL* 2003 (*beneficiary*).

Table A2.2: Chapter 2: Estimation results for sample [2] in Table 2.4†

Quantiles:	20%	50%	80%	OLS
beneficiary	144.3**	137.4***	201.0***	153.3***
	(73.44)	(51.41)	(72.16)	(48.27)
firstbir	1.621	-135.5	-191.1	-153.0
	(152.5)	(122.7)	(118.3)	(103.2)
second	-108.7	-113.0	2.495	-104.0
	(109.5)	(117.8)	(129.9)	(85.42)
third	-101.2	-46.56	85.43	-41.82
	(91.36)	(75.86)	(108.6)	(73.38)
female	-146.3**	-191.6***	-187.4***	-166.5***
	(65.73)	(50.16)	(67.34)	(44.78)
daysafwe	5.631	5.552**	5.741	6.101**
	(3.824)	(2.278)	(3.851)	(2.649)
young	-104.7	-198.4*	-353.4***	-244.8**
	(202.8)	(106.8)	(132.3)	(113.2)
old	-4.890	17.01	-9.548	49.47
	(88.90)	(65.83)	(94.02)	(58.47)
smoked	-484.4*	67.06	78.47	-11.56
	(278.8)	(163.8)	(191.6)	(144.6)
qualindex	283.5*	186.9	32.80	98.02
	(150.7)	(128.4)	(220.6)	(124.9)
indig	-142.4	-149.0**	-112.8	-150.5**
	(92.39)	(71.29)	(85.00)	(61.63)
edu6head	-187.2**	-27.41	-50.74	-109.5*
	(91.08)	(62.38)	(88.19)	(59.48)
edplushead	-26.75	63.03	112.2	2.841
	(82.07)	(72.30)	(111.6)	(67.55)
agehead	2.277	3.974	3.559	3.793
	(4.211)	(3.395)	(3.727)	(2.587)
famsize	-9.283	-11.37	-38.12**	-24.01*
	(22.88)	(14.77)	(17.60)	(12.47)
propage5	107.4	87.57	158.8	119.1
	(358.4)	(327.6)	(393.1)	(289.2)
prage6_17	144.6	425.4	692.6**	336.3
	(315.4)	(286.4)	(344.1)	(241.3)
econindex	-79.39	-185.6	-259.9	-135.8
	(160.2)	(137.5)	(160.6)	(108.4)
altitude	-0.0119	-0.0654	-0.0311	-0.0283
	(0.0456)	(0.0408)	(0.0438)	(0.0346)
Constant	2620***	3031***	3582***	3190***
	(284.2)	(262.1)	(394.1)	(249.6)

†N=760; R2 (OLS): 0.088. (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regs.)) Significance level: *: 10%, **: 5%, ***: 1%

Table A2.3: Chapter 2: Estimation results for sample [3] in Table 2.4†

Quantiles:	20%	50%	80%	OLS
beneficiary	141.0**	136.2**	201.1***	155.6***
	(70.19)	(54.23)	(71.68)	(48.00)
firstbir	-0.350	-145.5	-204.9*	-153.8
	(161.3)	(127.6)	(118.3)	(103.2)
second	-111.5	-95.24	0.196	-103.5
	(108.9)	(116.1)	(123.4)	(85.45)
third	-103.5	-49.12	77.03	-43.56
	(99.29)	(78.09)	(106.6)	(73.37)
female	-149.3**	-188.9***	-192.5***	-165.4***
	(64.47)	(49.86)	(71.92)	(44.76)
daysafwe	5.590	5.440**	5.689	6.064**
	(3.860)	(2.277)	(3.932)	(2.647)
young	-94.03	-194.5*	-345.8***	-245.7**
	(206.7)	(112.1)	(130.6)	(113.3)
old	-1.064	13.28	-11.29	49.79
	(87.50)	(69.72)	(96.39)	(58.42)
smoked	-477.1*	101.7	79.97	-13.25
	(286.0)	(161.0)	(167.9)	(144.6)
qualindex	285.2*	182.7	34.44	99.91
	(159.8)	(124.2)	(215.6)	(124.8)
indig	-147.6	-155.2**	-116.3	-152.7**
	(95.49)	(69.37)	(82.18)	(61.82)
edu6head	-193.1**	-27.33	-53.53	-109.7*
	(92.26)	(67.26)	(88.47)	(59.52)
edplushead	-27.86	72.94	111.2	2.741
	(84.47)	(78.75)	(113.1)	(67.62)
agehead	2.031	4.116	3.546	3.786
	(4.265)	(3.299)	(3.657)	(2.588)
famsize	-7.573	-12.73	-37.54**	-24.32*
	(22.92)	(14.32)	(18.19)	(12.47)
propage5	103.8	78.80	145.3	119.7
	(361.2)	(324.6)	(386.6)	(289.3)
prage6_17	132.3	446.5	668.6*	339.4
	(311.2)	(284.5)	(353.4)	(241.6)
econindex	-59.96	-180.5	-262.7*	-137.1
	(175.8)	(142.3)	(159.0)	(108.5)
altitude	-0.0138	-0.0636	-0.0307	-0.0293
	(0.0462)	(0.0412)	(0.0435)	(0.0347)
Constant	2627***	3031***	3597***	3191***
	(301.9)	(262.3)	(385.7)	(249.6)

†N=760; R2 (OLS): 0.089. (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regs.)) Significance level: *: 10%, **: 5%, ***: 1%

Table A2.4: Chapter 2: Estimation results for sample [4] in Table 2.4†

Quantiles:	20%	50%	80%	OLS
beneficiary	79.49	114.1**	151.3*	109.0**
	(76.80)	(51.71)	(83.21)	(51.16)
firstbir	37.66	-153.8	-177.4	-150.1
	(158.3)	(118.7)	(129.7)	(102.5)
second	-32.96	-133.4	-40.18	-91.41
	(112.8)	(112.4)	(131.0)	(85.55)
third	-83.42	-50.18	72.90	-29.73
	(94.80)	(72.93)	(108.7)	(74.07)
female	-152.4**	-181.8***	-187.6***	-159.2***
	(67.65)	(49.74)	(70.08)	(45.13)
daysafwe	5.891	5.324**	6.437*	6.197**
	(3.808)	(2.254)	(3.861)	(2.667)
young	-93.21	-186.8*	-320.7**	-246.7**
	(201.9)	(106.2)	(135.7)	(110.5)
old	37.86	16.83	2.522	57.99
	(91.51)	(67.11)	(94.83)	(58.78)
smoked	-555.8*	22.19	70.77	-13.19
	(297.3)	(156.8)	(181.7)	(144.9)
qualindex	274.6*	220.4*	11.13	112.8
	(159.3)	(132.6)	(230.1)	(124.8)
indig	-178.1*	-159.1**	-94.55	-159.7**
	(99.70)	(67.72)	(76.79)	(62.42)
edu6head	-127.7	-16.33	-38.62	-96.67
	(90.63)	(62.56)	(85.63)	(60.15)
edplushead	55.25	88.34	120.8	11.13
	(85.12)	(70.54)	(113.0)	(67.79)
agehead	4.043	4.257	2.862	3.399
	(4.310)	(3.299)	(3.623)	(2.537)
famsize	-13.18	-16.81	-39.12**	-27.32**
	(24.74)	(14.62)	(17.99)	(12.88)
propage5	342.1	79.14	105.4	151.0
	(352.3)	(314.1)	(385.9)	(287.8)
prage6_17	273.1	467.3*	584.4*	397.7
	(327.1)	(273.5)	(345.5)	(246.2)
econindex	-40.32	-180.6	-255.4*	-152.4
	(169.6)	(140.0)	(151.4)	(107.8)
altitude	-0.00692	-0.0664	-0.00661	-0.0343
	(0.0462)	(0.0417)	(0.0418)	(0.0350)
Constant	2438***	3016***	3658***	3207***
	(300.7)	(251.1)	(410.3)	(248.7)

†N=767; R2 (OLS): 0.083. (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regs.)) Significance level: *: 10%, **: 5%, ***: 1%

Table A2.5: Chapter 2: Estimation results for sample [5] in Table 2.4†

Quantiles:	20%	50%	80%	OLS
beneficiary	102.6	163.7***	184.0**	161.9***
	(73.26)	(50.00)	(81.07)	(50.41)
hh2_benef	-252.4	-293.9	-617.9*	-432.8*
	(420.1)	(275.4)	(315.2)	(231.9)
hh2	145.0	186.4	451.1	243.2
	(392.5)	(255.7)	(306.5)	(214.7)
firstbir	-117.8	-114.9	-144.4	-176.8*
	(165.2)	(106.5)	(107.3)	(94.21)
second	-80.18	-99.36	-42.56	-98.34
	(105.0)	(105.9)	(123.9)	(82.74)
third	-61.85	-30.01	99.83	-20.11
	(94.28)	(76.77)	(111.4)	(71.67)
female	-173.1***	-173.2***	-188.5***	-170.7***
	(62.87)	(50.39)	(64.08)	(43.75)
daysafwe	5.104	6.277***	6.978*	5.949**
	(3.329)	(2.415)	(3.759)	(2.545)
young	-58.91	-191.7*	-414.8***	-239.1**
	(185.9)	(99.87)	(107.0)	(99.02)
old	-73.37	-31.43	-30.26	-0.0535
	(87.87)	(66.96)	(88.84)	(58.17)
smoked	-556.4**	140.1	34.31	-46.35
	(277.5)	(168.3)	(148.3)	(143.3)
qualindex	301.9*	66.60	31.70	51.56
	(165.2)	(147.1)	(191.0)	(126.5)
indig	-154.3*	-164.0**	-106.2	-171.9***
	(90.39)	(65.96)	(81.94)	(62.00)
edu6head	-140.8*	-16.66	-42.88	-94.39
	(84.38)	(61.47)	(80.99)	(59.88)
edplushead	21.69	64.67	89.83	9.395
	(82.90)	(72.98)	(101.5)	(68.07)
agehead	3.580	3.465	3.075	4.441*
	(4.258)	(3.188)	(3.401)	(2.549)
famsize	19.04	-2.562	-24.56*	-14.58
	(21.00)	(13.17)	(14.74)	(11.81)
propage5	184.5	77.99	118.7	147.0
	(345.5)	(299.7)	(371.9)	(278.2)
prage6_17	76.10	428.0	627.6*	361.4
	(305.5)	(265.0)	(322.0)	(229.5)
econindex	-179.4	-197.2	-267.9*	-184.7
	(164.5)	(140.5)	(161.2)	(112.7)
altitude	0.00518	-0.0566	-0.0273	-0.0251
	(0.0449)	(0.0401)	(0.0427)	(0.0345)
Constant	2406***	3076***	3564***	3154***
	(306.2)	(258.0)	(368.3)	(246.0)

†N=805; R2 (OLS): 0.092. (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regressions)). Significance level:*: 10%, **: 5%, ***: 1%

Table A2.6: Chapter 2: Estimation results for sample [2] in Table 2.5†

Quantiles:	20%	50%	80%	OLS
treatint	2.481*	1.726	3.667**	2.589**
	(1.386)	(1.298)	(1.549)	(1.023)
firstbir	35.13	-213.0	-263.4**	-187.9*
	(159.6)	(130.8)	(131.7)	(103.7)
second	-155.9	-147.9	-71.88	-120.5
	(112.4)	(113.2)	(125.9)	(87.79)
third	-81.87	-68.11	58.85	-39.85
	(93.78)	(81.37)	(105.4)	(75.64)
female	-185.2***	-187.6***	-178.4**	-170.6***
	(65.09)	(53.34)	(69.47)	(45.58)
daysafwe	5.389	7.013***	4.850	6.003**
	(3.916)	(2.715)	(3.657)	(2.695)
young	-120.9	-132.1	-357.2**	-243.2**
	(215.0)	(114.7)	(148.0)	(115.8)
old	-21.70	23.07	1.104	42.46
	(86.59)	(75.02)	(93.33)	(60.11)
smoked	-464.7*	74.33	-15.18	-12.88
	(281.3)	(174.4)	(188.7)	(149.4)
qualindex	335.7**	106.1	52.66	90.52
	(167.7)	(159.4)	(213.9)	(133.5)
indig	-156.5	-114.0	-125.7	-143.9**
	(95.63)	(70.88)	(78.53)	(62.17)
edu6head	-189.3**	-1.536	-70.21	-107.9*
	(88.62)	(72.58)	(92.84)	(60.82)
edplushead	-15.77	76.40	60.27	0.814
	(81.38)	(86.55)	(112.7)	(69.13)
agehead	4.353	1.420	3.652	3.931
	(4.471)	(3.651)	(3.852)	(2.726)
famsize	-2.997	3.891	-25.39	-23.97*
	(22.37)	(14.87)	(17.74)	(12.90)
propage5	191.0	-200.6	-75.32	86.44
	(341.1)	(331.0)	(401.0)	(298.6)
prage6_17	115.6	175.4	413.8	313.2
	(304.4)	(293.0)	(353.0)	(250.9)
econindex	-63.85	-206.6	-206.7	-124.7
	(166.3)	(152.2)	(162.4)	(112.0)
altitude	0.0135	-0.0436	-0.0341	-0.0253
	(0.0430)	(0.0425)	(0.0453)	(0.0355)
Constant	2466***	3269***	3728***	3257***
	(300.7)	(299.3)	(392.3)	(264.8)

†N=744; Treatint coeff.=birthweight gain per month for babies born in benef. families. (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regs.)) Sig.level:*:10%,**:5%,***:1%

Table A2.7: Chapter 2: Estimation results for sample [3] in Table 2.5†

Quantiles:	20%	50%	80%	OLS
beneficiary	109.8	120.2**	184.3**	120.4**
	(71.38)	(47.92)	(71.97)	(46.85)
firstbir	-8.673	-126.7	-126.6	-158.2
	(149.0)	(115.2)	(120.6)	(99.94)
second	-79.03	-124.8	5.239	-112.8
	(105.7)	(114.3)	(127.1)	(81.78)
third	-121.6	-59.38	-15.97	-69.32
	(96.52)	(70.67)	(100.8)	(69.14)
female	-170.3***	-148.1***	-112.9*	-144.9***
	(64.05)	(50.00)	(66.89)	(43.75)
daysafwe	6.644*	5.229**	4.183	5.738**
	(3.577)	(2.306)	(3.732)	(2.566)
young	-55.44	-131.7	-308.6**	-192.3*
	(211.4)	(114.6)	(151.9)	(114.3)
old	9.003	25.01	26.26	62.00
	(88.59)	(69.33)	(95.62)	(57.58)
smoked	-543.4*	95.56	124.4	-6.182
	(289.7)	(164.1)	(164.9)	(144.5)
qualindex	275.1	237.0**	-113.4	65.59
	(168.4)	(119.4)	(252.5)	(128.4)
indigo	-91.41	-185.6***	-128.1*	-143.1**
	(88.97)	(61.85)	(75.98)	(57.93)
edu6head	-148.9*	-45.57	-56.08	-107.5*
	(90.17)	(64.58)	(86.07)	(59.17)
edplushead	17.94	46.39	110.1	12.36
	(84.56)	(78.39)	(104.0)	(67.09)
agehead	1.314	1.825	0.470	2.397
	(4.242)	(3.298)	(3.695)	(2.542)
famsize	-0.289	-10.14	-42.36**	-20.96*
	(22.53)	(12.95)	(16.41)	(12.00)
propage5	71.71	-53.22	7.125	-22.82
	(337.5)	(244.2)	(383.8)	(252.1)
prage6_17	22.88	387.6*	605.9*	220.7
	(293.2)	(229.5)	(322.0)	(211.5)
econindex	-35.16	-83.03	-97.09	-98.62
	(164.8)	(134.1)	(153.5)	(106.8)
altitude	0.00441	-0.0773*	-0.0214	-0.0249
	(0.0452)	(0.0422)	(0.0414)	(0.0331)
Constant	2610***	3096***	3847***	3326***
	(297.8)	(224.4)	(402.0)	(229.1)

†Results obtained using the post-matching sample (N=785); (Std. errors (robust for OLS, bootstrapped (1000 reps.) for quantile regs.)) Sig.level: *:10%, **:5%,***:1%

Table A2.8: Chapter 2: Estimation results for model [4] in Table 2.5†

Quantiles:	20%	50%	80%	OLS
beneficiary	135.2**	155.0**	206.5***	157.2***
	(66.5)	(63.2)	(68.3)	(50.61)
firstbir	-8.6	-142.3	-204.2*	-157.4
	(145.1)	(125.8)	(121.8)	(103.8)
second	-125.9	-142.0	0.552	-114
	(106.7)	(108.9)	(120.8)	(87.25)
third	-81.7	-56.4	77.70	-44.33
	(93.6)	(87.4)	(104.9)	(74.87)
female	-182.4***	-191.3***	-190.9***	-168.3***
	(59.5)	(55.1)	(60.5)	(45.40)
daysafwe	5.886*	5.358*	5.787*	6.114**
	(3.484)	(2.896)	(2.969)	(2.674)
young	-88.7	-198.6	-355.2***	-250.1**
	(163.0)	(131.3)	(135.7)	(115.6)
old	-34.6	11.1	-16.00	44.31
	(80.2)	(74.8)	(81.8)	(59.93)
smoked	-458.7**	69.4	77.59	-9.786
	(261.6)	(164.5)	(159.2)	(149.5)
qualindex	308.3*	124.9	36.96	80.98
	(158.2)	(165.4)	(179.7)	(133.5)
indig	-123.7	-149.7**	-113.3	-144.2**
	(81.4)	(75.5)	(77.8)	(62.19)
edu6head	-179.1**	-48.5	-51.44	-110.0*
	(76.8)	(74.6)	(78.8)	(60.53)
edplushead	-12.9	61.5	110.3	1.338
	(79.0)	(86.4)	(97.5)	(68.65)
agehead	2.898	3.438	3.47	3.551
	(4.032)	(3.548)	(3.614)	(2.668)
famsize	-6.507	-13.731	-36.90**	-23.29*
	(20.38)	(16.75)	(18.15)	(12.84)
propage5	209.4	22.3	156.3	109.1
	(345.3)	(331.2)	(375.0)	(293.9)
prage6_17	186.5	402.1	688.8**	326.3
	(311.0)	(301.2)	(339.7)	(247.6)
econindex	-58.6	-132.3	-263.6*	-125.3
	(155.8)	(149.4)	(148.3)	(112.4)
altitude	0.001	-0.058	-0.030	-0.0248
	(0.046)	(0.043)	(0.044)	(0.0354)
Constant	2510***	3129***	3581***	3207***
	(315.9)	(302.3)	(337.9)	(258.3)

†N=744. Heteroskedasticity consistent standard errors in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01.

Table A2.9: Chapter 2: Estimation results for model [5] in Table 2.5†

Quantiles:	20%	50%	80%
beneficiary	141.5*	141.6**	174.4**
	(74.26)	(67.38)	(75.80)
firstbir	-136.2	-95.68	-220.8
	(174.0)	(130.4)	(135.4)
second	-81.92	-92.06	-32.01
	(119.9)	(103.9)	(121.7)
third	-0.704	-15.02	7.989
	(89.51)	(87.72)	(99.37)
female	-198.1***	-195.6***	-180.3***
	(64.80)	(60.55)	(65.75)
daysafwe	4.185	6.979**	8.918**
	(2.677)	(2.877)	(4.423)
young	-55.48	-378.7***	-225.4*
	(197.2)	(142.0)	(119.8)
old	-47.31	16.36	60.64
	(79.35)	(74.89)	(83.69)
smoked	-275.5	49.93	183.9
	(175.5)	(137.2)	(185.9)
qualindex	231.5	182.9	20.73
	(164.2)	(143.4)	(164.6)
indig	-87.00	-145.7**	-109.0
	(76.82)	(70.27)	(73.51)
edu6head	-151.1**	-54.01	-111.8
	(74.61)	(80.91)	(95.21)
edplushead	6.536	2.928	52.39
	(81.86)	(88.76)	(107.7)
agehead	4.725	1.631	0.991
	(3.533)	(3.673)	(3.984)
famsize	-2.256	-8.344	-30.36
	(18.49)	(19.90)	(19.25)
propage5	626.6*	6.502	-91.75
	(363.6)	(297.1)	(347.6)
prage6_17	330.0	396.2	432.1
	(321.4)	(272.8)	(303.4)
econindex	-89.59	-139.2	-171.1
	(155.0)	(145.9)	(161.0)
altitude	-0.00662	-0.0122	-0.0180
	(0.0425)	(0.0427)	(0.0453)
Constant	2365***	3090***	3827***
	(316.5)	(256.4)	(342.7)

†Sample size=744. Bootstrapped standard errors (800 repetitions) in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01.

Table A3.1: Chapter 3: Estimation results for sample [2] in Table 3.7†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	1.359***	1.420***	0.035	0.059**
	(0.220)	(0.221)	(0.030)	(0.030)
Age at marriage	-0.168***	-0.169***	-0.006	-0.006
	(0.033)	(0.033)	(0.004)	(0.004)
Age difference	-0.013	-0.004	-0.002	0.002
	(0.032)	(0.032)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.342	-0.383	-0.003	-0.021
	(0.297)	(0.300)	(0.035)	(0.035)
Woman: Completed secondary	-1.241***	-1.165***	-0.060	-0.021
	(0.423)	(0.426)	(0.053)	(0.053)
Husband: Completed primary	0.212	0.016	0.049	-0.041
	(0.298)	(0.300)	(0.035)	(0.035)
Husband: Completed secondary	0.318	0.045	0.070	-0.057
	(0.383)	(0.385)	(0.046)	(0.046)
Caste [None]				
Scheduled caste / tribe	0.613**	0.623**	0.019	0.022
	(0.280)	(0.283)	(0.033)	(0.032)
Other backward caste	0.195	0.151	0.016	-0.005
	(0.279)	(0.282)	(0.036)	(0.036)
No sikh / hindu	0.050	0.016	0.009	-0.007
	(0.312)	(0.315)	(0.039)	(0.039)
Wealth quintile [Richest]				
Less than richer	0.423	0.290	0.044	-0.019
	(0.374)	(0.378)	(0.045)	(0.045)
Richer	0.366	0.282	0.031	-0.009
	(0.309)	(0.311)	(0.037)	(0.037)
Nuclear family	0.329*	0.439**	-0.012	0.038
	(0.199)	(0.200)	(0.024)	(0.024)
Rural household	-0.548	-0.345	-0.063	0.032
	(0.368)	(0.371)	(0.059)	(0.059)
Rural*Progress	-0.586	-0.513	-0.036	-0.001
	(0.421)	(0.421)	(0.058)	(0.057)
Constant	4.621***	4.605***		
	(0.731)	(0.736)		
Log-Likelihood	-1679.0818			
N	1912			

†This includes only women who are either censored or whose firstborn is still alive and the baseline *progressivity* index (see Section 3.3.2). Base category in square brackets. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). *: 10%, **: 5%, ***: 1%.

Table A3.2: Chapter 3: Estimation results for model [3] in Table 3.7†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	1.453***	1.495***	0.040	0.054**
	(0.210)	(0.208)	(0.027)	(0.027)
Age at marriage	-0.176***	-0.178***	-0.006	-0.006
	(0.033)	(0.033)	(0.004)	(0.004)
Age difference	-0.017	-0.005	-0.003	0.002
	(0.032)	(0.032)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.473	-0.503*	-0.009	-0.022
	(0.299)	(0.302)	(0.034)	(0.034)
Woman: Completed secondary	-1.551***	-1.408***	-0.083	-0.011
	(0.434)	(0.436)	(0.053)	(0.052)
Husband: Completed primary	0.197	-0.021	0.054	-0.048
	(0.297)	(0.299)	(0.034)	(0.033)
Husband: Completed secondary	0.264	-0.048	0.077*	-0.069
	(0.383)	(0.386)	(0.044)	(0.044)
Caste [None]				
Scheduled caste / tribe	0.717**	0.740***	0.019	0.027
	(0.281)	(0.284)	(0.032)	(0.031)
Other backward caste	0.278	0.211	0.024	-0.008
	(0.279)	(0.283)	(0.035)	(0.035)
No sikh / hindu	0.057	0.088	-0.005	0.009
	(0.311)	(0.313)	(0.038)	(0.038)
Wealth quintile [Richest]				
Less than richer	0.197	-0.060	0.062	-0.057
	(0.358)	(0.363)	(0.041)	(0.041)
Richer	0.212	0.103	0.031	-0.021
	(0.300)	(0.302)	(0.035)	(0.034)
Nuclear family	0.443**	0.551***	-0.008	0.040*
	(0.196)	(0.197)	(0.023)	(0.023)
Rural household	-0.613	-0.337	-0.080	0.050
	(0.376)	(0.375)	(0.060)	(0.059)
Rural*Progress	-0.564	-0.598	-0.012	-0.025
	(0.423)	(0.423)	(0.057)	(0.056)
Constant	4.982***	4.964***		
	(0.735)	(0.740)		
Log-Likelihood	-1761.7118			
N	2032			

†This specification uses the baseline sample and a *progressivity* index estimated using only "hard" covariates (see Section 3.4.3). Base category in square brackets. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). *: 10%, **: 5%, ***: 1%.

Table A3.3: Chapter 3: Estimation results for model [4] in Table 3.7†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	0.958***	1.124***	0.005	0.076**
	(0.256)	(0.255)	(0.034)	(0.034)
Age at marriage	-0.113***	-0.155***	0.004	-0.015***
	(0.034)	(0.035)	(0.005)	(0.005)
Age difference	-0.013	-0.007	-0.002	0.001
	(0.033)	(0.033)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.185	-0.367	0.030	-0.051
	(0.320)	(0.325)	(0.042)	(0.042)
Woman: Completed secondary	-0.863*	-0.870*	-0.034	-0.034
	(0.457)	(0.462)	(0.062)	(0.061)
Husband: Completed primary	0.302	0.081	0.059	-0.043
	(0.307)	(0.311)	(0.040)	(0.040)
Husband: Completed secondary	0.350	0.076	0.072	-0.054
	(0.392)	(0.396)	(0.052)	(0.051)
Caste [None]				
Scheduled caste / tribe	0.504*	0.527*	0.016	0.024
	(0.284)	(0.288)	(0.036)	(0.036)
Other backward caste	0.177	0.152	0.013	0.000
	(0.288)	(0.293)	(0.040)	(0.040)
No sikh / hindu	0.200	0.312	-0.015	0.035
	(0.334)	(0.337)	(0.042)	(0.042)
Wealth quintile [Richest]				
Less than richer	0.554	0.077	0.122**	-0.096*
	(0.391)	(0.398)	(0.051)	(0.051)
Richer	0.358	0.157	0.057	-0.036
	(0.321)	(0.325)	(0.042)	(0.042)
Nuclear family	0.361*	0.417**	0.003	0.027
	(0.207)	(0.210)	(0.028)	(0.028)
Rural household	-0.630*	-0.375	-0.079	0.039
	(0.379)	(0.383)	(0.063)	(0.063)
Rural*Progress	-0.184	-0.168	-0.011	-0.003
	(0.460)	(0.461)	(0.067)	(0.066)
Constant	3.340***	4.246***		
	(0.780)	(0.789)		
Log-Likelihood	-1394.4039			
N	1543			

†This specification uses only women who married in or after 1995 (post-ultrasound), and the baseline *progressivity* index (see Section 3.3.2). Base category in square brackets. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). *: 10%, **: 5%, ***: 1%.

Table A3.4: Chapter 3: Estimation results for model [5] in Table 3.7†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	0.630**	0.803***	0.010	0.077*
	(0.296)	(0.296)	(0.049)	(0.047)
Age at marriage	-0.086**	-0.116***	0.000	-0.012*
	(0.040)	(0.041)	(0.007)	(0.007)
Age difference	0.016	0.008	0.002	-0.001
	(0.039)	(0.040)	(0.006)	(0.006)
Highest Education [None / incomplete primary]				
Woman: Completed primary	0.088	-0.420	0.099*	-0.116**
	(0.361)	(0.373)	(0.058)	(0.057)
Woman: Completed secondary	-0.385	-0.401	-0.022	-0.025
	(0.524)	(0.532)	(0.087)	(0.085)
Husband: Completed primary	0.312	0.121	0.055	-0.028
	(0.349)	(0.358)	(0.055)	(0.054)
Husband: Completed secondary	0.270	-0.060	0.078	-0.064
	(0.442)	(0.450)	(0.072)	(0.070)
Caste [None]				
Scheduled caste / tribe	0.653**	0.652**	0.043	0.036
	(0.320)	(0.329)	(0.049)	(0.048)
Other backward caste	0.025	0.105	-0.013	0.021
	(0.311)	(0.318)	(0.053)	(0.052)
No sikh / hindu	0.163	0.312	-0.017	0.045
	(0.367)	(0.372)	(0.058)	(0.057)
Wealth quintile [Richest]				
Less than richer	0.814*	0.155	0.174	-0.112**
	(0.443)	(0.460)	(0.071)	(0.071)
Richer	0.444	0.180	0.077	-0.038
	(0.358)	(0.369)	(0.058)	(0.058)
Nuclear family	0.118	0.108	0.010	0.004
	(0.233)	(0.238)	(0.038)	(0.037)
Rural household	-0.784*	-0.382	-0.125	0.052
	(0.429)	(0.425)	(0.080)	(0.077)
Rural*Progress	-0.007	-0.013	0.001	-0.002
	(0.566)	(0.562)	(0.097)	(0.093)
Constant	2.164**	3.071***		
	(0.942)	(0.958)		
Log-Likelihood	-819.15234			
N	841			

†This includes only women who married in or after 1994 (ultrasound widely available), and the baseline *progressivity* index (see Section 3.3.2). Base category in square brackets. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). *: 10%, **: 5%, ***: 1%.

Table A3.5: Chapter 3: *Progress* on the firstborn's gender†

Variable	
Female	0.012
	(0.021)
Age at marriage	0.024***
	(0.004)
Age difference	0.003
	(0.003)
Highest Education [None / incomplete primary]	
Woman: Completed primary	0.354***
	(0.030)
Woman: Completed secondary	0.988***
	(0.040)
Husband: Completed primary	-0.058*
	(0.031)
Husband: Completed secondary	0.111***
	(0.041)
Caste [None]	
Scheduled caste / tribe	-0.234***
	(0.028)
Other backward caste	-0.224***
	(0.032)
No sikh / hindu	-0.051
	(0.035)
Wealth quintile [Richest]	
Less than richer	-0.545***
	(0.037)
Richer	-0.361***
	(0.032)
Nuclear family	0.207***
	(0.021)
Rural household	0.621***
	(0.041)
Constant	-0.357***
	(0.076)
Adj. R2	0.709
N	1893

†The sample includes only women who already had a first child. Standard errors in parentheses. Asterisks denote the significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01

Table A3.6: Chapter 3: Firstborn's biological sex in Delhi using a simple index†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Average *progressivity*	1.181***	1.376***	-0.002	0.083*
	(0.373)	(0.377)	(0.045)	(0.045)
Age at marriage	-0.131***	-0.132***	-0.004	-0.004
	(0.031)	(0.031)	(0.004)	(0.004)
Age difference	-0.015	-0.004	-0.003	0.002
	(0.031)	(0.031)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	0.024	-0.002	0.006	-0.006
	(0.283)	(0.286)	(0.033)	(0.032)
Woman: Completed secondary	-0.205	-0.043	-0.042	0.034
	(0.369)	(0.372)	(0.044)	(0.044)
Husband: Completed primary	0.166	-0.050	0.052	-0.048
	(0.293)	(0.295)	(0.033)	(0.033)
Husband: Completed secondary	0.426	0.109	0.083*	-0.065
	(0.376)	(0.378)	(0.044)	(0.044)
Caste [None]				
Scheduled caste / tribe	0.292	0.305	0.007	0.012
	(0.269)	(0.271)	(0.030)	(0.030)
Other backward caste	-0.050	-0.124	0.014	-0.020
	(0.271)	(0.274)	(0.034)	(0.034)
No sikh / hindu	-0.124	-0.102	-0.009	0.002
	(0.303)	(0.305)	(0.038)	(0.038)
Wealth quintile [Richest]				
Less than richer	-0.099	-0.353	0.052	-0.066
	(0.352)	(0.356)	(0.041)	(0.041)
Richer	-0.050	-0.159	0.022	-0.028
	(0.293)	(0.296)	(0.034)	(0.034)
Nuclear family	0.601***	0.706***	-0.003	0.044*
	(0.190)	(0.192)	(0.023)	(0.023)
Rural household	-0.563*	-0.283	-0.079*	0.052
	(0.331)	(0.330)	(0.044)	(0.043)
Constant	3.434***	3.301***		
	(0.698)	(0.704)		
Log-Likelihood	-1782.6642			
N	2032			

†This specification uses the baseline sample and an index which is the arithmetic mean of the four *progressivity* indicators. Base category in square brackets. Standard errors in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01

Table A3.7: Chapter 3: Firstborn's sex in Delhi using *progressivity* indicators

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
ω_1 : Decides on her own healthcare	0.384*	0.535**	-0.020	0.049**
	(0.212)	(0.213)	(0.024)	(0.023)
ω_2 : Allowed alone to the health clinic	0.910***	0.872***	0.039	0.018
	(0.203)	(0.205)	(0.027)	(0.027)
ω_3 : Wife beating is not justified	-0.060	-0.090	0.005	-0.009
	(0.211)	(0.213)	(0.025)	(0.025)
ω_4 : Refusing sex to husband is justified	-0.139	-0.027	-0.029	0.024
	(0.239)	(0.242)	(0.028)	(0.028)
Age at marriage	-0.131***	-0.132***	-0.004	-0.004
	(0.031)	(0.032)	(0.004)	(0.004)
Age difference	-0.014	-0.002	-0.003	0.002
	(0.031)	(0.031)	(0.004)	(0.004)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.011	-0.030	0.004	-0.005
	(0.283)	(0.286)	(0.033)	(0.032)
Woman: Completed secondary	-0.228	-0.043	-0.048	0.039
	(0.371)	(0.374)	(0.044)	(0.044)
Husband: Completed primary	0.237	0.016	0.056	-0.047
	(0.292)	(0.294)	(0.034)	(0.033)
Husband: Completed secondary	0.509	0.186	0.087*	-0.064
	(0.375)	(0.377)	(0.044)	(0.044)
Caste [None]				
Scheduled caste / tribe	0.242	0.250	0.006	0.009
	(0.269)	(0.271)	(0.031)	(0.030)
Other backward caste	-0.131	-0.208	0.012	-0.023
	(0.273)	(0.276)	(0.034)	(0.034)
No sikh / hindu	-0.070	-0.051	-0.006	0.003
	(0.304)	(0.307)	(0.038)	(0.038)
Wealth quintile [Richest]				
Less than richer	-0.079	-0.336	0.053	-0.066
	(0.352)	(0.357)	(0.041)	(0.041)
Richer	-0.075	-0.185	0.021	-0.029
	(0.295)	(0.297)	(0.034)	(0.034)
Nuclear family	0.499**	0.613***	-0.008	0.043*
	(0.194)	(0.196)	(0.023)	(0.023)
Rural household	-0.615*	-0.336	-0.081*	0.050
	(0.334)	(0.333)	(0.044)	(0.043)
Constant	3.596***	3.467***		
	(0.711)	(0.717)		
Log-Likelihood	-1774.0568			

†This uses the baseline sample (N=2032). Std. errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table A3.8: Chapter 3: Estimation results for the firstborn's gender in Kerala†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	0.995***	1.021***	0.027	0.040
	(0.278)	(0.277)	(0.034)	(0.034)
Age at marriage	-0.159***	-0.158***	-0.006	-0.005
	(0.026)	(0.026)	(0.003)	(0.003)
Age difference	-0.113***	-0.112***	-0.004	-0.003
	(0.025)	(0.025)	(0.003)	(0.003)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.187	-0.208	-0.002	-0.011
	(0.365)	(0.366)	(0.039)	(0.039)
Woman: Completed secondary	-0.802*	-0.932**	0.002	-0.059
	(0.435)	(0.435)	(0.050)	(0.050)
Husband: Completed primary	-0.064	-0.015	-0.013	0.010
	(0.283)	(0.283)	(0.032)	(0.032)
Husband: Completed secondary	-0.050	0.185	-0.052	0.057
	(0.376)	(0.376)	(0.045)	(0.045)
Caste [None]				
Scheduled caste / tribe	-0.351	-0.424	0.004	-0.030
	(0.320)	(0.322)	(0.040)	(0.040)
Other backward caste	0.189	0.081	0.029	-0.021
	(0.203)	(0.203)	(0.024)	(0.024)
No sikh / hindu	-0.186	-0.086	-0.028	0.019
	(0.204)	(0.204)	(0.024)	(0.024)
Wealth quintile [Richest]				
Less than richer	-0.043	-0.233	0.039	-0.049
	(0.356)	(0.358)	(0.038)	(0.039)
Richer	-0.541**	-0.605***	-0.004	-0.034
	(0.217)	(0.217)	(0.026)	(0.026)
Nuclear family	1.084***	1.119***	0.028	0.045**
	(0.229)	(0.229)	(0.023)	(0.023)
Rural household	-0.621*	-0.801**	0.018	-0.066
	(0.351)	(0.350)	(0.041)	(0.040)
Rural*Progress	-0.360	-0.313	-0.022	0.000
	(0.296)	(0.295)	(0.036)	(0.036)
Constant	7.024***	7.122***		
	(0.867)	(0.867)		
Log-Likelihood	-1828.8189			
N	2120			

†This uses the baseline *progressivity* index extracted for Kerala from the all-India sample (see Section 3.3.2). Standard errors in parentheses. Significance level: *: 10%, **: 5%, ***: 1%

Table A3.9: Chapter 3: Estimation results for the firstborn's gender in Punjab†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	1.360***	1.345***	0.039	0.027
	(0.269)	(0.272)	(0.031)	(0.031)
Age at marriage	-0.114***	-0.111***	-0.003	-0.002
	(0.033)	(0.034)	(0.004)	(0.003)
Age difference	-0.086***	-0.086***	-0.002	-0.002
	(0.025)	(0.026)	(0.003)	(0.003)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.921***	-0.798***	-0.051*	0.010
	(0.297)	(0.299)	(0.028)	(0.028)
Woman: Completed secondary	-2.303***	-2.354***	-0.048	-0.065
	(0.413)	(0.420)	(0.048)	(0.048)
Husband: Completed primary	0.067	-0.124	0.045	-0.046*
	(0.276)	(0.277)	(0.027)	(0.027)
Husband: Completed secondary	0.032	-0.018	0.012	-0.012
	(0.424)	(0.428)	(0.046)	(0.046)
Caste [None]				
Scheduled caste / tribe	-0.400*	-0.355	-0.020	0.002
	(0.232)	(0.234)	(0.026)	(0.025)
Other backward caste	0.128	0.141	0.000	0.006
	(0.388)	(0.391)	(0.038)	(0.038)
No sikh / hindu	0.127	-0.292	0.097*	-0.101*
	(0.507)	(0.521)	(0.058)	(0.058)
Wealth quintile [Richest]				
Less than middle	-0.485	-0.386	-0.035	0.013
	(0.578)	(0.579)	(0.052	(0.051)
Middle	-0.944**	-0.620*	-0.097**	0.058
	(0.371)	(0.371)	(0.039)	(0.039)
Richer	-0.363	-0.392	-0.003	-0.015
	(0.271)	(0.274)	(0.029)	(0.028)
Nuclear family	0.535**	0.641***	-0.010	0.038*
	(0.246)	(0.247)	(0.023	(0.023)
Rural household	0.023	-0.018	0.010	-0.010
	(0.252)	(0.254)	(0.027)	(0.026)
Rural*Progress	-0.579*	-0.503	-0.032	0.006
	(0.312)	(0.314)	0.034	0.034
Constant	6.145***	5.954***		
	(0.777)	(0.782)		
Log-Likelihood	-1890.8637			

†Baseline index extracted for Punjab (N=2285). (std. errors). * p<0.1, ** p<0.05, *** p<0.01.

Table A3.10: Chapter 3: Firstborn's sex - Delhi women with husband interviewed†

	Coefficient Estimates		Marginal Effects	
Variable	Boys	Girls	Boys	Girls
Progress	1.258***	1.550***	-0.012	0.114**
	(0.435)	(0.437)	(0.057)	(0.055)
Age at marriage	-0.139**	-0.177***	0.003	-0.014*
	(0.060)	(0.061)	(0.008)	(0.007)
Age difference	0.027	-0.024	0.012	-0.012
	(0.061)	(0.063)	(0.008)	(0.008)
Highest Education [None / incomplete primary]				
Woman: Completed primary	-0.166	-0.049	-0.031	0.023
	(0.519)	(0.530)	(0.064)	(0.064)
Woman: Completed secondary	-1.258*	-1.056	-0.092	0.007
	(0.696)	(0.710)	(0.094)	(0.094)
Husband: Completed primary	-0.574	-0.876	0.041	-0.093
	(0.577)	(0.585)	(0.065)	(0.065)
Husband: Completed secondary	-0.306	-0.894	0.112	-0.154*
	(0.729)	(0.739)	(0.086)	(0.085)
Caste [None]				
Scheduled caste / tribe	0.133	0.498	-0.072	0.094
	(0.473)	(0.481)	(0.059)	(0.059)
Other backward caste	-0.210	-0.006	-0.051	0.043
	(0.518)	(0.528)	(0.071)	(0.071)
No sikh / hindu	-0.618	-0.263	-0.099	0.066
	(0.588)	(0.589)	(0.080)	(0.078)
Wealth quintile [Richest]				
Less than richer	0.431	0.192	0.067	-0.044
	(0.694)	(0.708)	(0.088)	(0.088)
Richer	0.517	0.102	0.108	-0.084
	(0.557)	(0.569)	(0.069)	(0.069)
Nuclear family	-0.131	0.115	-0.057	0.056
	(0.373)	(0.379)	(0.048)	(0.047)
Rural household	-0.880	-1.011	-0.007	-0.062
	(0.567)	(0.626)	(0.114)	(0.118)
Rural*Progress	-0.608	-0.635	-0.018	-0.027
	(0.674)	(0.708)	(0.113)	(0.114)
Constant	4.938***	5.632***		
	(1.335)	(1.354)		
Log-Likelihood	-483.97018			
N	555			

†This uses only women with husbands interviewed and the baseline *progressivity* index. Standard errors in parentheses (bootstrapped (1000 reps.) for *progress*). * p<0.1, ** p<0.05, *** p<0.01.

Table A3.11: Chapter 3: Results for other covariates in Model [3] in Table 3.8†

	Coefficient Estimates		Marginal Effects††	
Variable	Boys	Girls	Boys	Girls
Age at marriage	0.234***	0.296***	0.005	0.029*
	(0.064)	(0.074)	(0.014)	(0.015)
Age difference	0.043*	0.078**	-0.003	0.011
	(0.025)	(0.037)	(0.006)	(0.007)
Highest Education [None / incomplete primary]				
Woman: Completed primary	0.769***	0.973***	0.015	0.095
	(0.278)	(0.336)	(0.062)	(0.068)
Woman: Completed secondary	0.457	0.848*	-0.040	0.121
	(0.379)	(0.485)	(0.074)	(0.087)
Husband: Completed primary	-0.509	-0.024	-0.122*	0.086
	(0.412)	(0.510)	(0.069)	(0.083)
Husband: Completed secondary	-0.091	-0.180	0.010	-0.027
	(0.293)	(0.388)	(0.052)	(0.065)
Caste [None]				
Scheduled caste / tribe	0.158	0.315	-0.018	0.047
	(0.214)	(0.303)	(0.043)	(0.054)
Other backward caste	-0.167	-0.251	0.004	-0.030
	(0.306)	(0.383)	(0.047)	(0.059)
No sikh / hindu	0.286	0.473	-0.014	0.062
	(0.241)	(0.336)	(0.053)	(0.064)
Wealth quintile [Richest]				
Less than richer	0.085	-0.337	0.082	-0.096
	(0.320)	(0.427)	(0.057)	(0.071)
Richer	0.122	-0.085	0.045	-0.042
	(0.286)	(0.368)	(0.046)	(0.058)
Nuclear family	-0.270	-0.094	-0.050	0.026
	(0.204)	(0.262)	(0.032)	(0.040)
Rural household	-0.826**	-0.742	-0.071	-0.029
	(0.355)	(0.456)	(0.070)	(0.082)
Log-Likelihood	-4924.899			
N	2032			

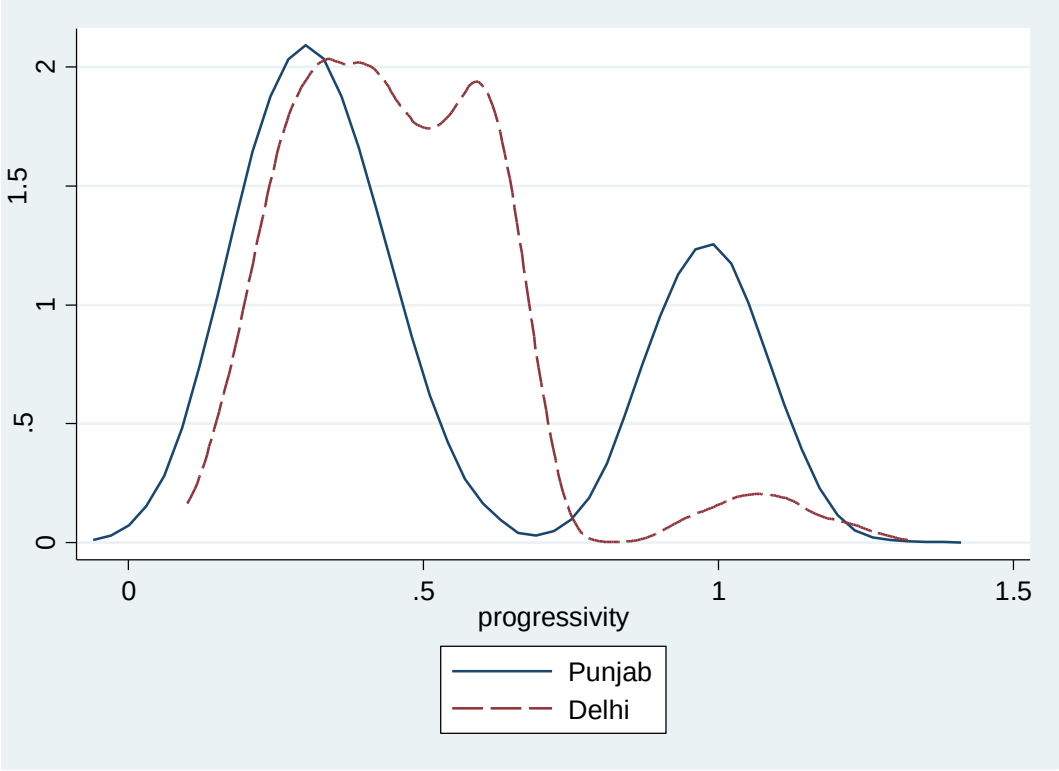
† Base category in square brackets. Robust standard errors for cluster-correlated data (White / Huber / sandwich estimator) in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01

Table A3.12: Chapter 3: Results for other covariates in Model [4] in Table 3.8†

	Coefficient Estimates		Marginal Effects††	
Variable	Boys	Girls	Boys	Girls
Age at marriage	0.253***	0.248***	0.018	0.014
	(0.057)	(0.077)	(0.015)	(0.017)
Age difference	0.041***	0.059**	0.000	0.007
	(0.028)	(0.030)	(0.006)	(0.006)
Highest Education [None / incomplete primary]				
Woman: Completed primary	0.929	0.895**	0.069	0.047
	(0.339)	(0.351)	(0.067)	(0.067)
Woman: Completed secondary	0.661	0.795*	0.020	0.071
	(0.477)	(0.468)	(0.083)	(0.080)
Husband: Completed primary	-0.538	-0.045	-0.125*	0.086
	(0.440)	(0.436)	(0.067)	(0.064)
Husband: Completed secondary	-0.110	-0.157	0.001	-0.018
	(0.320)	(0.324)	(0.050)	(0.049)
Caste [None]				
Scheduled caste / tribe	0.139	0.242	-0.009	0.033
	(0.228)	(0.258)	(0.039)	(0.043)
Other backward caste	-0.198	-0.219	-0.009	-0.017
	(0.371)	(0.353)	(0.050)	(0.044)
No sikh / hindu	0.320	0.393	0.008	0.037
	(0.247)	(0.274)	(0.048)	(0.051)
Wealth quintile [Richest]				
Less than richer	0.042	-0.292	0.063	-0.078
	(0.352)	(0.365)	(0.057)	(0.057)
Richer	0.124	-0.051	0.040	-0.034
	(0.293)	(0.295)	(0.044)	(0.043)
Nuclear family	-0.302	-0.118	-0.054*	0.026
	(0.215)	(0.218)	(0.030)	(0.030)
Rural household	-1.124**	-0.754	-0.111	0.010
	(0.456)	(0.464)	(0.067)	(0.069)
Rural*Progress	0.452	0.229		
	(0.410)	(0.385)		
Log-Likelihood	-4913.043			
N	2032			

† Base category in square brackets. Robust standard errors for cluster-correlated data (White / Huber / sandwich estimator) in parentheses. Significance level (double sided): * p<0.1, ** p<0.05, *** p<0.01

Figure A3.1: *Progressivity* index: Punjab versus Delhi



References

Abrevaya, J. (2001) The effects of demographics and maternal behaviour on the distribution of birth outcomes. *Empirical Economics 26*, 247-257.

Abrevaya, J. and Dahl, C. (2008) The Effects of Birth Inputs on Birthweight, *Journal of Business and Economic Statistics 26*, 379-397.

Adato, M., B. de la Briere, D. Mindek and A. R. Quisumbing (2000) The Impact of PROGRESA on Women's Status and Intrahousehold Relations, *Final Report IFPRI*, 95 pp.

Agarwal, B. (1994) *A Field of One's Own: Gender and Land Rights in South Asia*. Cambridge: Cambridge University Press.

Alfano, M., W. Arulampalam and U. Kambhampati (2011) Maternal Autonomy and the Education of the Subsequent Generation: Evidence from Three Contrasting States in India, *IZA Discussion Paper No. 6019*.

Almond, D. and L. Edlund (2008) Son-biased sex ratios in the 2000 United States Census, *Proceedings of the National Academy of Sciences of the United States of America 105*, 5681-5682.

Alvarez, C., Devoto, F. and Winters, P. (2008) Why do beneficiaries leave the safety net in Mexico? A study of the effects of conditionality on dropouts. *World Development 36*, 641-658.

Andalon, M. (2009) *Oportunidades* to reduce smoking in Mexico? Paper presented at the Annual Meeting of the Population Association of America, Detroit (30 April-2 May).

Angelucci, M. (2004) Aid and Migration: An Analysis of the Impact of Progresa on the Timing and Size of Labour Migration, *IZA Discussion Paper No. 1187*.

Angelucci, M. (2008) Love on the rocks: Domestic Violence and Alcohol Abuse in Rural Mexico, *B.E Journal of Economic Analysis and Policy 8*, Article 43.

Angelucci, M. and G. de Giorgi (2009) Indirect Effects of an Aid Program: How Do Cash Transfers Affect Ineligibles' Consumption? *American Economic Review 99*, 486-508.

Anonymous, The Manusmriti. The laws of Manu, Georg Buehler, Translator, Dover Publications Inc., New York 1886, 620 p. Available at: http://www.sacredtexts.com/hin/manu.htm (accessed 13 February 2013).

Arnold, F and Kishor, S and Roy, T (2002) Sex-Selective Abortions in India, *Population and Development Review 28*, 759-785.

Attanasio, O., C. Meghir and A. Santiago (2010) Education Choices in Mexico: Using a Structural Model and a Randomized Experiment to Evaluate PROGRESA, *IFS Working Papers W10/14*, Institute for Fiscal Studies.

Bales, K., Trodd, Z. and A. Kent Williamson (2009). *Modern Slavery: The Secret World of 27 Million People*, Oneworld Publications.

Bando, R., L. F. Lopez-Calva and H. A. Patrinos (2005) Child Labor, School Attendance, and Indigenous Households: Evidence from Mexico, *Policy Research Working Paper Series 3487*, The World Bank.

Bando, R., S. Freije and F. Arce (2006) Conditional Transfers, Labor Supply, and Poverty: Microsimulating Oportunidades, *Journal of the Latin American and Caribbean Economic Association 7*, 73-108.

Barber, S. L. and P. J. Gertler (2008) The impact of Mexico's conditional cash transfer program, Oportunidades, on birthweight. *Tropical Medicine and International Health*, 13, 1405–1414.

Barber, S. L. and P. J. Gertler (2010) Empowering women: how Mexico's conditional cash transfer programme raised prenatal care quality and birth weight, *The Journal of Development Effectiveness 2*, 51-73.

Barham, T. and J. Rowberry. Forthcoming. Living Longer: The Effect of the Mexican Conditional Cash Transfer Program on Elderly Mortality, *Journal of Development Economics*.

Barham, T. (2011) A Healthier Start: The Effect of Conditional Cash Transfers on Neonatal and Infant Mortality in Rural Mexico, *Journal of Development Economics 94*, 74-85.

Basu A. M. and Koolwal G. B. (2005) Two concepts of female empowerment: Some leads from DHS data on women's status and reproductive health. In *A focus on gender: Collected papers on gender using DHS data*, edited by S. Kishor. Calverton, MD: ORC Macro.

Becker, S. (1997). Incorporating women's empowerment in studies of reproductive health: an example from Zimbabwe, paper presented at the Seminar on Female Empowerment and Demographic Processes, Lund (20-24 April).

Behrman, J. R., P. Sengupta and P. Todd (2000) The impact of PROGRESA on achievement test scores in the first year, *IFPRI*, 56 pp.

Behrman, J. R. and Rosenzweig, M. R. (2004) Returns to birthweight. *The Review of Economics and Statistics 86*, 586–601.

Behrman, J. R., P. Sengupta and P. E. Todd (2005) Progressing through PROGRESA: An Impact Assessment of a School Subsidy Experiment in Rural Mexico, *Economic Development and Cultural Change 54*, 237-275.

Behrman, J. R. and J. Hoddinott (2005) Programme Evaluation with Unobserved Heterogeneity and Selective Implementation: The Mexican PROGRESA Impact on Child Nutrition, *Oxford Bulletin of Economics and Statistics 67*, 547-69.

Behrman J. R., S. W. Parker and P. E. Todd (2009) Schooling Impacts of Conditional Cash Transfers on Young Children: Evidence from Mexico, *Economic Development and Cultural Change 57*, 439-477.

Behrman, J. R., S. W. Parker and P. E. Todd (2011) Do Conditional Cash Transfers for Schooling Generate Lasting Benefits? A Five-Year Followup of PROGRESA/Oportunidades, *Journal of Human Resources 46*, 93-122.

Behrman, J. R., J. Gallardo-García, S. W. Parker, P. E. Todd and V. Vélez Grajales (2012). Are conditional cash transfers effective in urban areas? Evidence from Mexico, *Education Economics 20*, 233-259.

Ben-Porath, Y. and Welch F. (1976). Do Sex Preferences Really Matter? *The Quarterly Journal of Economics 90*, 285–307.

Bhalla, N. (2012). India advances, but many women still trapped in dark ages. *TrustLaw & Thomson Reuters Foundation Service*. Available at: www.trust.org/trustlaw/news/ (accessed 17 September 2012).

Bhalotra, S. R. and T. Cochrane (2010) Where Have All the Young Girls Gone? Identification of Sex Selection in India, *IZA Discussion Paper No. 5381*.

Blanchet, T. (2005) Bangladeshi Girls Sold as Wives in North India, *Indian Journal of Gender Studies 12*, 305-334.

Boardman, J. D., Powers, D. A., Padilla, Y. C. and Hummer, R. A. (2002) Low birth weight, social factors, and developmental outcomes among children in the United States. *Demography 39*, 353-368.

Boyce, S. and Gertler, P. (2001) An experiment in incentive-based welfare, the impact of PROGRESA on health in Mexico, mimeo, University of California at Berkeley.

Bradshaw, S. and A. Quirós Víquez (2008) Women Beneficiaries or Women Bearing the Cost? A Gendered Analysis of the *Red de Protección Social* in Nicaragua, *Development and Change 39*, 823-844.

Breslau, N. and Bohnert, K. M. (2008) Early interventions to improve attention skills in urban low-birthweight children might yield better outcomes later. *Archives of General Psychiatry 65*, 1080-1086.

Britannica Online Encyclopædia (2013) Ramcharitmanas (work by Tulsidas). Available at: http://www.britannica.com/EBchecked/topic/490595/Ramcharitmanas (accessed 16 February 2013).

Buddelmeyer, H. and E. Skoufias (2003) An Evaluation of the Performance of the Regression Discontinuity Design on PROGRESSA, *IZA Discussion Paper No. 827*.

Burke, J (2013) Delhi rape: how India's other half lives, *Guardian*, 10 September. Available at http://www.theguardian.com/world/2013/sep/10/delhi-gang rape-india-women (accessed 18 September 2013).

Cacho, Lydia (2010), *Slavery Inc. The untold story of international sex trafficking*, Portobello.

Cárdenas-Rodríguez, O. J., G. González-König, D. Ojeda-Revah, and Q. Wodon (2004) Do indigenous peoples benefit from poverty programs? Evidence from Mexico´s 2000 census, *Estudios Económicos 19*, 125-135.

Chaudhuri, S. (2012) Female Infant Mortality Disadvantage in India, *Review of Radical Political Economics 44,* 321-326.

Chavez-Martin del Campo, J.C. (2006). Does Conditionality Generate Heterogeneity and Regressivity in Program Impacts? The Progresa Experience, *Working Paper 2006-09,* Department of Applied Economics, Cornell University.

Chhachhi, A. and C. Sathyamala (1983) Sex Determination Tests: A Technology which will Eliminate Women, *Medico Friends Circle Bulletin 95*, 3-5.

Cho, Y. (2005). *Three Essays in Public Economics*, Ph.D. Dissertation, The University of Wisconsin, Madison, USA, 128 pages.

Chowdhury, R. (1988) The Infant Mortality-Fertility Debate: Some International Evidence, *Southern Economic Journal 54*, 666-674.

Cleland, J., J. F. Phillips, S. Amin and G. M. Kamal (1994) *The Determinants of Reproductive Change in Bangladesh: Success in a Challenging Environment*. Washington, DC: The World Bank.

Coady, D. P. and S. W. Parker (2004) A Cost-Effectiveness Analysis of Demand- and Supply-Side Education Interventions: The Case of PROGRESA in Mexico, *Review of Development Economics 8,* 440-51.

Coady, D. P. (2006). The Welfare Returns to Finer Targeting: The Case of the Progresa Program in Mexico, *International Tax and Public Finance 13*, 217-39.

Coale, A. (1991). Excess Female Mortality and the Balance of the Sexes in the Population: An Estimate of the Number of 'Missing Females', *Population and Development Review 17*, 517-523.

Consejo Nacional de Evaluacion de la Politica de Desarrollo Social (CONEVAL), (2013). Resultados de la medicion de pobreza 2012. Comunicado de Prensa No. 003. (29 July). Available from /Informes/Coordinacion/Pobreza_2012/COMUNICADO_PRENSA_003 MEDICION_2012.pdf (accessed 9 September 2013).

Consejo Nacional de Poblacion (CONAPO), Secretaria General (2004) Sample design of the survey to measure the impact of the Oportunidades program on reproductive health (in Spanish). Available from http://evaluacion.oportunidades.gob.mx (requires registration, accessed 17 December 2008).

Coria-Soto, I. L., Bobadilla, J. L. and Notzon, F. (1996) The effectiveness of antenatal care in preventing intrauterine growth retardation and low birth weight due to preterm delivery. *International Journal for Quality in Health Care 8*, 13-20.

Daniel, F. J. (2013) India rape accused hunted victim, aimed to kill: police, *Reuters*, 11 January. Available at: http://uk.reuters.com/article/2013/01/11/us-india-rape-charge-idUSBRE90A05G20130111 (accessed 11 January 2013).

Das Gupta, M. (1987) Selective Discrimination among Female Children in Rural Punjab, *Population and Development Review 13*, 77-100.

Dasgupta, M. and Shuzhuo, L. (1999) Gender Bias in China, South Korea and India 1920-1990: Effects of War, Famine and Fertility Decline, *Development and Change (Special Issue in Gender, Poverty and Wellbeing) 30*, 619-52.

Davis, B., S. Handa and H. Soto (2004) Households, Poverty and Policy in Times of Crisis: Mexico, 1992-1996, *CEPAL Review 82*, 191-212.

Davis, B., M. Stampini, G. Stecklov and P. Winters (2005). Do Conditional Cash Transfers Influence Migration? A Study Using Experimental Data from the Mexican PROGRESA Programme *Demography 42*, 769-790.

De Janvry, A. and E. Sadoulet, (2006). Making Conditional Cash Transfer Programs More Efficient: Designing for Maximum Effect of the Conditionality, *World Bank Economic Review 20*, 1-29.

De Janvry A., F. Finan, E. Sadoulet, and R. Vakis (2006) Can conditional cash transfer programs serve as safety nets in keeping children at school and from working when exposed to shocks? *Journal of Development Economics 79*, 349 – 373.

Desai, S. and K. Johnson (2005). Women's Decision making and Child Health: Familial and Social Hierarchies. In *A focus on gender: Collected papers on gender using DHS data*, edited by S. Kishor. Calverton, MD: ORC Macro.

Dixon-Mueller, R. (1998). Female empowerment and demographic processes: Moving beyond Cairo. *Policy and Research Papers No. 13*, International Union for the Scientific Study of Population (IUSSP), Paris. Available from http://www.iussp.org/sites/default/files/PRP13.pdf (accessed 18 September 2013).

Djebbari, H. and J. Smith (2008). Heterogeneous Impacts in PROGRESA, *Journal of Econometrics 145*, 64-80.

Douthat, R. (2011) 160 Million and Counting, *The New York Times*. June 26.

Dreze, J. and A. Sen (1995) *India, Economic Development and Social Opportunity*. Oxford: Oxford University Press.

Dubois, P., A. de Janvry and E. Sadoulet (2012). Effects on School Enrolment and Performance of a Conditional Cash Transfers Program in Mexico, *Journal of Labour Economics 30*, 555-589.

Dubuc, S. and D. Coleman (2007) An Increase in the Sex Ratio of Births to India born Mothers in England and Wales: Evidence for Sex-Selective Abortion, *Population and Development Review 33*, 383-400.

Duflo, E. (2012). Women Empowerment and Economic Development, *Journal of Economic Literature 50*, 1051-79.

Dyson, T. and M. Moore (1983) On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review 9*, 35-60.

Economic Commission for Latin America and the Caribbean (2013) *Social Panorama of Latin America 2013, Briefing paper*. Available at http://www.eclac.cl/publicaciones/xml/8/51768/SocialPanorama2013Briefing.pdf (accessed 5 December 2013).

Edlund, L., Li, H., Yi, J. and Zhang, J (2007), Sex Ratios and Crime: Evidence from China's One-Child Policy, *IZA Discussion Paper No. 3214*.

Espinosa, G. (2006) La participación en la actividad económica de las mujeres de Oportunidades y su relación con la corresponsabilidad de éste y otros programas sociales. In *El Programa Oportunidades examinado desde el género*, coordinated by M. de la Paz López and V. Salles. México D.F.: Oportunidades / UNIFEM / El Colegio de México.

Fall, C. H. D., Yajnik, C. S., Rao, S., Davies, A. A., Brown, N. and Farrant, H. J. W. (2003) Micronutrients and Fetal Growth. *Journal of Nutrition 133*, 1747S-1756S.

Fan, C. and Y. Huang (1998) Waves of Rural Brides: Female Marriage Migration in China, *Annals of Association of American Geographers 88*, 227-51.

Fathalla, M. (1998). The missing millions, *People Planet 7*, 10-1.

Feresu, S. A, Sioban D. H. and Godfrey, B. W. (2004) Risk factors for prematurity at Harare Maternity Hospital, Zimbabwe. *International Journal of Epidemiology 33*, 1194-1201.

Fernald, L.C.H., P.J. Gertler and L.M. Neufeld (2008) The role of cash in conditional cash transfer programs: An analysis of Mexico's Oportunidades, *The Lancet 371*, 828-837.

Fernald, L.C.H., X. Hou, and P. J. Gertler (2008a) Oportunidades Program Participation and Body Mass Index, Blood Pressure, and Self-Reported Health in Mexican Adults, *Preventing Chronic Disease 5*, A81.

Fernald, L.C.H., P. J. Gertler and X. Hou (2008b) Cash component of conditional cash transfer program is associated with higher body mass index and blood pressure in adults, *Journal of Nutrition 138*, 2250-7.

Fernald, L.C.H., Gertler, P.J., and Neufeld, L.M. (2009) Ten-year impact of Oportunidades-Mexico's conditional cash transfer program on child growth, cognition, language and behavior. *The Lancet 374*, 1997-2005.

Ferraz E. M., Gray, R. H. and Cunha, T. M. (1990) Determinants of preterm delivery and intrauterine growth retardation in North-East Brazil. *International Journal of Epidemiology 19*, 101-8.

Firpo S., Fortin, N. M. and Lemieux, T. (2009) Unconditional quantile regressions. *Econometrica 77*, 953-973.

Fierlbeck, K. (1997) Getting representation right for women in development: accountability, consent, and the articulation of women's interests. In *Getting institutions right for women in development*, edited by A. M. Goetz. New York: Zed Books.

Frankenberg, E. and D. Thomas (2001) Measuring Power. Food Consumption and Nutrition Division Discussion Paper No. 113. International Food Policy Research Institute. Washington DC.

Friede A., W. Baldwin, P. H. Rhodes, J. W. Buehler, L. T. Strauss, J. C. Smith, and C. J. Hogue (1987). Young maternal age and infant mortality: the role of low birth weight, *Public Health Rep 102*, 192–199.

Frölich, M., and B. Melly (2008). Unconditional quantile treatment effects under endogeneity. *IZA Discussion Paper No. 3288.*

Frölich, M., and B. Melly (2010). Estimation of quantile treatment effects with Stata. *Stata Journal 10*, 423-457.

Galiani S. and P. J. McEwan (2013) The heterogeneous impact of conditional cash transfers**,** *Journal of Public Economics 103*, 85-96.

Gertler, P. (2004). Do Conditional Cash Transfers Improve Child Health? Evidence from PROGRESA's Control Randomized Experiment, *American Economic Review* (*Papers and Proceedings) 94,* 336-341.

Gertler, P. J., S. W. Martinez, and M. Rubio-Codina (2012) Investing cash transfers to raise long-term living standards, *American Economic Journal: Applied Economics 4*, 164-92.

Giussani, D.A., P.S. Phillips, S. Anstee and D. J. P. Barker (2001) Effects of Altitude versus Economic Status on Birth Weight and Body Shape at Birth, *Pediatric Research 49*, 490-494.

Goldani, M. Z., M. A. Barbieri, A. A. M. Silva and H. Bettiol (2004) Trends in prenatal care use and low birthweight in southeast Brazil. *American Journal of Public Health 94*, 1366-1371.

Goldstein, H (2003). *Multilevel statistical models*. 3rd Edition, Kendall's Library of Statistics 3, Arnold, London.

Government of National Capital Territory of Delhi, Planning Department (2011). Chapter 3: Demographic Profile. *Economic Survey of Delhi, 2008–2009*, pp. 17–31. Available at http://delhi.gov.in/wps/wcm/connect/DoIT_Planning/planning/economic+survey+ofdehli/economic+survey+of+delhi+2008+-+2009n (accessed 22 October 2012).

Govindasamy, P. and A. Malhotra (1996) Women's position and family planning in Egypt, *Studies in Family Planning 27*, 328-40.

Green, T. R. (2005). The Political Economy of a Social Transfer Program: Evidence from PROGRESA in Mexico, University of California, Berkeley, paper presented at the 63rd Midwest Political Science Association Conference, Chicago (7-10 April).

Guilmoto, C.Z. (2007) Sex-ratio imbalance in Asia: Trends, consequences and policy responses, paper presented at the 4th Asia Pacific Conference on Reproductive and Sexual Health and Rights, Hyderabad (29-31 October). Available from: http://www.unfpa.org/gender/docs/studies/summaries/regional_analysis.pf (accessed 18 September 2013).

Habicht, J., J. A. Rivera, D. Sotres-Alvarez, T. Shamah and S. Villalpando (2004) Impact of the Mexican Program for Education, Health, and Nutrition (Progresa) on Rates of Growth and Anaemia in Infants and Young Children, A Randomized Effectiveness Study, *Journal of the American Medical Association 291*, 2563-2570.

Haddad, L. (1999) The welfare impacts of the income earned by women. *Agricultural Economics 20*, 135-41.

Haub, C. (2009). India's Population Policy, *Online-Handbook Demography*, The Berlin Institute for Population and Development. Available at: http://www.berlininstitut.org/online-handbookdemography/india.html (accessed 15 September 2011).

Hashemi, S. M., S. R. Schuler and A. P. Riley (1996) Rural Credit Programs and Women's Empowerment in Bangladesh, *World Development 24*: 635-53.

Hesketh T. and Z. W. Xing (2006) Abnormal sex ratios in human populations: Causes and consequences, *Proceedings of the National Academy of Sciences of the United States of America 103*, 13271-13275.

Hindin, M. J (2000) Women's power and anthropometric status in Zimbabwe *Social Science and Medicine 51*, 1517-28.

Hindin, M. J (2002) Who is at risk? Factors Associated with Intimate Partner Violence in the Philippines, *Social Science and Medicine 55*, 1385-1399.

Hindin, M. J. (2005) Women's autonomy, women's status and nutrition in Zimbabwe, Zambia and Malawi. In *A focus on gender: Collected papers on gender using DHS data*, edited by S. Kishor. Calverton, MD: ORC Macro.

Hoddinott, J. and Skoufias, E. (2004) The impact of PROGRESA on food consumption, *Economic Development and Cultural Change 53*, 37–61.

Hudson, V. M. and A. M. den Boer (2004) *Bare Branches: The Security Implications of Asia's Surplus Male Population*. Cambridge, MA: MIT Press.

Hudson, V. M. and den Boer, A.M. (2002) A Surplus of Men, A Deficit of Peace: Security and Sex Ratios in Asia's Largest States, *International Security 26*, 5-38.

Hvistendahl, M. (2011) *Unnatural selection: choosing boys over girls, and the consequences of a world full of men*. New York: Public Affairs.

Instituto Nacional de Salud Publica (INSP) and SEDESOL (2006) General Rural Methodology Note (in Spanish). Available from

http://evaluacion.oportunidades.gob.mx (requires registration, accessed 24 November 2008).

International Institute for Population Sciences (IIPS) and Macro International (2007). *National Family Health Survey 2005-2006*. Available at: www.measuredhs.com (requires registration)

Jacobsen, R., Møller, H., and Mouritsen, A. (1999) Natural Variation in the Human Sex Ratio, *Human Reproduction 14*, 3120-5.

Jackson, C. (1996) Rescuing Gender from the Poverty Trap, *World Development 24*, 489-504.

Jejeebhoy S. (1995) *Women's education, autonomy and reproductive behavior: Experience from developing countries*. Oxford: Clarendon Press.

Jejeebhoy, S (1998). Wife beating in Rural India: A Husband's Right? Evidence from Survey Data. *Economic and Political Weekly 33*, 855-862.

Jejeebhoy, S (2000) Women's autonomy in rural India: its dimensions, determinants and the influence of context. In *Women's Empowerment and Demographic Processes: Moving Beyond Cairo*, edited by H. Presser and G. Sen. Oxford: Oxford University Press.

Jha, P., Kumar, R., Vasa, P., Dhingra, N., Thiruchelvam, D., and Moineddin, R. (2006). Low Male-to-Female Sex Ratio of Children Born in India: National Survey of 1.1 Million Households, *The Lancet 367*, 211-218.

Jha, P., Kesler, M. A., Kumar, R., Ram, F., Ram, U., Aleksandrowicz, L., Bassani, D.G., Chandra, S., Banthia, J.K. (2011). Trends in selective abortions of girls in India: analysis of nationally representative birth histories from 1990 to 2005 and census data from 1991 to 2011, *The Lancet 377*, 1921-8.

Johnston, W. R. (2012). India abortions and live births by state and territory, 1971-2011. *Johnston's Archive*. Available at http://www.johnstonsarchive.net/policy/abortion/india/ab-indias.html (accessed 22 February 2013).

Kabeer, N. (1999) Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment, *Development and Change 30*, 435-64.

Kaur, R. (2004) Across-Region Marriages: Poverty, Female Migration and the Sex Ratio, *Economic and Political Weekly 39*, 2595-2603.

Khashan A.S., Baker, P.N., and Kenny L.C (2010). Preterm birth and reduced birthweight in first and second teenage pregnancies: a register-based cohort study, *BMC Pregnancy and Childbirth 10:36*.

Kishor, S. and K. Neitzel (1996) *The Status of Women: Indicators for Twenty Five Countries*. DHS Comparative Studies No. 21. Calverton, Maryland, USA: Macro International Inc.

Kishor, S. (2000) Empowerment of Women in Egypt and Links to the Survival and Health of their Infants. In *Women's Empowerment and Demographic*

Processes: Moving Beyond Cairo, edited by H. B. Presser and G. Sen. Oxford: Oxford University Press.

Kishor S, editor. (2005) *A Focus on Gender: Collected Papers on Gender using DHS Data*. Calverton, MD: ORC Macro.

Kishor, S. and K. Gupta (2009) *Gender Equality and Women's Empowerment in India.* National Family Health Survey (NFHS-3), India, 2005-06. Mumbai: International Institute for Population Sciences; Calverton, Maryland, USA: ICF Macro.

Koczberski, G. (1998) Women in Development: a Critical Analysis, *Third World Quarterly 19*, 395-409.

Koenker, R. (2005) *Quantile Regression*, Econometric Society monographs no. 38, Ch. 1-2. Cambridge University Press.

Koenker, R. and Bassett, G. (1978) Regression quantiles. *Econometrica 46*, 33 50.

Koenker, R. and Bassett, G. (1982) Robust tests for heteroscedasticity based on regression quantiles. *Econometrica 50*, 43-61.

Koenker, R. and Hallock, K.F. (2001) Quantile Regression. *Journal of Economic Perspectives 15*, 143-156.

Kohler, H.P., A. Skytthe and K. Christensen (2001) The Age at First Birth and Completed Fertility Reconsidered: Findings from a Sample of Identical Twins, *MPIDR Working Paper WP 2001-006*, Max-Planck-Institute for Demographic Research.

Kritz, M., P. Makinwa-Adebusoye and D. T. Gurak (2000) The role of gender context in shaping reproductive behaviour in Nigeria. In *Women's Empowerment and Demographic Processes: Moving Beyond Cairo*, edited by H. Presser and G. Sen. Oxford: Oxford University Press.

Lalive, R. and M. A. Cattaneo (2009). Social Interactions and Schooling Decisions, *The Review of Economics and Statistics 91*, 457-477.

Lechene, V. and O. Attanasio (2002) Tests of Income Pooling in Household Decisions, *Review of Economic Dynamics 5*, 720-48.

Leroy, J. L., A. Garcia-Guerra, R. Garcia, C. Dominguez, J. Rivera, and L. M. Neufeld (2008). The Oportunidades Program Increases the Linear Growth of Children Enrolled at Young Ages in Urban Mexico, *Journal of Nutrition 138*, 793-798.

Maldonado, I., M. Nájera and A. Segovia (2006) Efectos del Programa Oportunidades en las relaciones de pareja y familiares. In *El Programa Oportunidades examinado desde el género*, coordinated by M. de la Paz López and V. Salles. México D.F.: Oportunidades / UNIFEM / El Colegio de México.

Malhotra A., R. Vanneman, and S. Kishor (1995) Fertility, dimensions of patriarchy, and development in India." *Population and Development Review 21*, 281-305.

Malhotra, A., S.R. Schuler, and C. Boender (2002). Measuring Women's Empowerment as a Variable in International Development, paper prepared for the World Bank Workshop on Poverty and Gender: New Perspectives, Washington, DC (28 June). Available at: http://siteresources.worldbank.org/INTGENDER/Resources/MalhotraSchlerBoender.pdf (accessed 23 August 2013).

Mason, K. and H. L. Smith (2000) Husbands' versus wives fertility goals and use of contraception: The influence of gender context in five Asian countries, *Demography 37*, 299-311.

Matthews, Z., M. Brookes, R. W. Stones and M. Bazle Hossain (2005). Village in the City: Autonomy and Maternal Health-seeking among Slum Populations of Mumbai. In *A focus on gender: Collected papers on gender using DHS data*, edited by S. Kishor. Calverton, MD: ORC Macro.

Mavalankar, D. V., Gray, R. H. and Trivedi, C. R. (1992) Risk factors for preterm and term low birthweight in Ahmedabad, India. *International Journal of Epidemiology 21*, 263-272.

Mayor, S. (2004). Pregnancy and childbirth are leading causes of death in teenage girls in developing countries, *BMJ 328: 1152*.

McCormick, M. C. (1985). The contribution of low birthweight to infant mortality and childhood morbidity. *New England Journal of Medicine 312*, 82-90.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behaviour, in P.Zarembka, ed., *Frontiers in Econometrics*, Academic Press, New York, pp. 105-142.

McIntire, D. D., Bloom, S. L., Casey, B. M. and Leveno, K. J. (1999). Birth weight in relation to morbidity and mortality among newborn infants. *New England Journal of Medicine 340*, 1234-1238.

Miller, B. D. (1997). *The Endangered Sex: Neglect of Female Children in Rural North India*, Oxford University Press.

Mishra, J. (2000). *Women and Human Rights*. Chapter 5. Kalpaz Publications, New Delhi.

Molyneux, M. (2006) Mothers at the service of the new poverty agenda: Progresa / Oportunidades, Mexico's conditional transfer programme, *Social Policy & Administration, 40*: 425-449.

Morgan, P. and B. Niraula (1995) Gender Inequality and Fertility in Two Nepali Villages, *Population and Development Review 21*: 541-61.

Mumtaz, Z., E. Slaymaker and S. Salway (2005) Condom Use in Uganda and Zimbabwe: Exploring the Influence of Gendered Access to Resources and Couple-level Dynamics. In *A focus on gender: Collected papers on gender using DHS data*, edited by S. Kishor. Calverton, MD: ORC Macro.

Mundlak, Y. (1978). On the Pooling of Time Series and Cross-Section Data, *Econometrica 46*, 69-85.

Nangia, S. (2005) Women's empowerment and gender equity, paper presented at the XXV IUSSP International Population Conference, Tours (18-23 July).

Nath, D. C., Land, K. C. and Goswami, G. (1999). Effects of the status of women on the first birth interval in Indian urban society, *Journal of Biosocial Science 31,* 55-69.

Nayak P. and B. Mahanta (2012). Gender disparity and women empowerment in Assam, mimeo, available at the Social Science Research Network: http://dx.doi.org/10.2139/ssrn.2187677 (accessed 27 August 2013).

Osili, U. O. and B. T. Long (2008). Does female schooling reduce fertility? Evidence from Nigeria, *Journal of Development Economics 87,* 57-75.

Oswald, A. J. and N. Powdthavee (2010) Daughters and left-wing voting, *Review of Economics and Statistics 92*, 213–227.

Otoo-Oyortey, N. and S. Pobi (2003). Early marriage and poverty: Exploring Links and Key Policy Issues, *Gender & Development 11*, 42-51.

Ozer, E.J., Fernald, L.C.H., Manley, J. and Gertler, P.J. (2009) The effects of a conditional cash transfer program on the behavior problems of young children living in extreme poverty: a quasi-experimental evaluation of Mexico's Oportunidades intervention. *Pediatrics 123*, e630-e637.

Ozer, E., Fernald, L.C.H., Weber, A., Flynn, E., VanderWeele, T.J. (2011) Does alleviating poverty affect mothers' depression? A quasi-experimental investigation of Mexico's Oportunidades program. *International Journal of Epidemiology 40*, 1565-76.

Palloni, A. and H. Rafalimanana (1999) The Effects of Infant Mortality on Fertility Revisited: New Evidence from Latin America, *Demography 36*, 41-58.

Parker, S. and E. Skoufias (2000) The Impact of PROGRESA on Work, Leisure, and Time Allocation, International Food Policy Research Institute. Washington DC.

Parker, S. W. and Gómez de León, J. (2000). Bienestar y Jefatura Femenina En Los Hogares Mexicanos. In *Familia, Genero y Pobreza*, edited by M. de la Paz Lopez and V. Salles, México D.F.: Miguel Ángel Porrúa.

Parpart, J.L., S. M. Rai and K. Staudt, editors (2002) Rethinking em(power)ment, gender and development: An introduction. In *Rethinking Empowerment: Gender and development in a global / local world*. London: Routledge / Warwick Studies in Globalisation.

Pastrana, D. (2005) El Programa Oportunidades Fracasa. Mucho dinero, pobres resultados, *Masiosare 389,* (5 June), UNAM, Mexico.

Poertner, C.C (2010). Sex Selective Abortions, Fertility and Birth Spacing, University of Washington, Department of Economics, *Working Papers UWEC-2010-04-R*.

Powell, J.L. (1986), "Censored Regression Quantiles," *Journal of Econometrics 32*, 143-155.

Rabe-Hesketh, S., Skrondal, A. and Pickles, A. (2004). GLLAMM Manual, Berkeley Electronic Press, U.C. Berkeley Division of Biostatistics, *Working Paper Series 160*.

Rao, V (1997). Wife-beating in Rural South India: A Qualitative and Econometric Analysis. *Social Science and Medicine 44*, 1169-80.

Razavi, S. (1994) Agrarian Change and Gender Relations in South-east Iran, *Development and Change 25*, 591-634.

Red Nacional de Promotoras y Asesoras Rurales (2000). Dinero del diablo, report presented at the 23rd Special Session of the UN General Assembly on Women 2000: Gender Equality, Development and Peace for the 21st Century, New York (5-9 June).

Registrar General and Census Commissioner of India (2011). Census 2011, Ministry of Home Affairs, Government of India, New Delhi. Available at: http://www.censusindia.gov.in/ (accessed 16 September 2012).

Registrar General (2012). *Sample Registration System Statistical Report 2010*, Report No. 1 of 2012, Ministry of Home Affairs, Government of India, New Delhi. Available at: http://www.censusindia.gov.in/ (accessed 15 February 2013).

Retherford, R.D. and Roy, T.K. (2003). *Factors Affecting Sex-Selective Abortion in India and 17 Major States*, NFHS Subject Reports, No. 21, Mumbai: IIPS; and Honolulu: East-West Center.

Rivera, L., B. Hernández and R. Castro (2006) Asociación entre la violencia de pareja contra las mujeres de las zonas urbanas en pobreza extrema y la incorporación al Programa Oportunidades. In *El Programa Oportunidades examinado desde el género*, coordinated by M. de la Paz López and V. Salles. México D.F.: Oportunidades / UNIFEM / El Colegio de México.

Rocha Menocal, A. (2001) Do Old Habits Die Hard? A Statistical Exploration of the Politicisation of PROGRESA, Mexico's Latest Federal Poverty Alleviation Programme, under the Zedillo Administration, *Journal of Latin American Studies 33*, 513-538.

Rogers, W. (1992) Quantile Regression Standard Errors. *Stata Technical Bulletin 9*, 16-19. Reprinted in *Stata Technical Bulletin Reprints 2*, 133–137.

Rowlands, J. (1998) A word of the times, but what does it mean? Empowerment in the discourse and practice of development. In *Women and empowerment: illustrations from the Third World*, edited by H. Afshar, Basingstoke: Macmillan Press.

Royal Government of Bhutan (2012). *The Report of the High-Level Meeting on Wellbeing and Happiness: Defining a New Economic Paradigm*. New York: The Permanent Mission of the Kingdom of Bhutan to the United Nations. Thimphu: Office of the Prime Minister. Available at: http://sustainabledevelopment.un.org/content/documents/617BhutanReport_WEB_F.pdf (accessed 16 September 2013).

Rubalcava, R. M and S. Murillo (2006) El ingreso en los hogares rurales pobres y los beneficios monetarios del Programa Oportunidades vistos desde una perspectiva socioespacial de género: la jefatura económica femenina en Guanajuato. In *El Programa Oportunidades examinado desde el género*, coordinated by M. de la Paz López and V. Salles. México D.F.: Oportunidades / UNIFEM / El Colegio de México.

Rubalcava L. and Teruel G. (2006) Conditional Public Transfers and Living Arrangements in Rural Mexico, *California Center for Population Research Working Paper CCPR-006-06*.

Ruiz-Arranz, M., B. Davis, S. Handa, M. Stampini and P. Winters (2006). Program Conditionality and Food Security: The Impact of PROGRESA and PROCAMPO Transfers in Rural Mexico, *EconomiA 7*, 249-78.

Sathar, Z. A. and S. Kazi (2000) Women's autonomy in the context of rural Pakistan, *Pakistan Development Review 39*: 89-110.

Schuler, S. R., S. M. Hashemi and H. Pandit (1995) *Beyond Credit: SEWA's Approach to Women's Reproductive Lives in Urban India.* JSI Research Report.

Schultz, T. Paul (2004). School Subsidies for the Poor: Evaluating the Mexican PROGRESA Poverty Program, *Journal of Development Economics 74*, 199-250.

Secretaria de Desarrollo Social (SEDESOL) (2009) Reglas de Operacion del Programa de Desarrollo Humano Oportunidades. Available from http://www.oportunidades.gob.mx/ (accessed 9 September 2009).

Secretaria de Desarrollo Social (SEDESOL) (2013) Reglas de Operacion del Programa de Desarrollo Humano Oportunidades, para el ejercicio fiscal 2013. Available from http://oportunidades.gob.mx/Portal/wb/Web/2013_ (accessed 9 September 2013).

Sen, G. and C. Grown (1988) *Development, Crises and Alternative Visions: Third World Women's Perspectives*, London: Routledge.

Sen, A. (1990). More than 100 Million Women Are Missing. *New York Review of Books 37*, 20.

Sen, A. (1992). Missing Women, *BMJ 304*, 587–588.

Skoufias, E. (2007). Poverty Alleviation and Consumption Insurance: Evidence from PROGRESA in Mexico, *Journal of Socio-Economics 36*, 630-49.

Skoufias, E. and V. Di Maro (2008). Conditional Cash Transfers, Adult Work Incentives, and Poverty, *The Journal of Development Studies 44*, 935-960.

South, S. J. and K. Trent (1988) Sex Ratios and Women's Roles: A Cross National Analysis, *American Journal of Sociology 93*, 1096-1115.

South, S. J., K. Trent and S. Bose (2012) India's 'Missing Women' and Men's Sexual Risk Behavior, *Population Research and Policy Review*. July.

Stromquist, N. P. (2002) Education as a means for empowering women. In *Rethinking Empowerment: Gender and development in a global / local*

world, edited by J. L. Parpart, S. M. Rai and K. Staudt. London: Routledge / Warwick Studies in Globalisation.

Sudha, S. and S. Irudaya Rajan (1999). Female Demographic Disadvantage in India 1981-1991: Sex Selective Abortions and Female Infanticide, *Development and Change 30*, 585–618.

Takahashi, Y. (2007) The Political Economy of Poverty Alleviation: The Case of PROGRESA in Mexico, *Journal of International Cooperation Studies 14.3*, 109-137.

Teitelbaum, M.S (1970). Factors affecting the sex ratio in large populations. *J.Biosoc. Sci. Suppl. 2*, 61-71.

Thomas, D. (1990) Intrahousehold resource allocation: An inferential approach. *Journal of Human Resources 25*, 635-64.

Todd, P. (2004) Design of the evaluation and method used to select comparison group localities for the six year follow-up evaluation of Oportunidades in rural areas. Available from http://evaluacion.oportunidades.gob.mx (accessed 14 April 2009).

Todd, P. E., and K. I. Wolpin (2006a) Assessing the Impact of a School Subsidy Program in Mexico: Using a Social Experiment to Validate a Dynamic Behavioral Model of Child Schooling and Fertility, *American Economic Review 96*, 1384-1417.

Todd, P. E. and K. I. Wolpin (2008) Ex Ante Evaluation of Social Programs, *Annales d' Economie et de Statistique 91-92*, 263-291.

Tucker, J.D., G. E. Henderson, T. F. Wang, Y. Y. Huang, W. Parish, S. M. Pan, X. S. Chen and M. S. Cohen (2005) Surplus men, sex work, and the spread of HIV in China, *AIDS 19*, 539-547.

Trussell, T. J. and J. Menken (1978). Early child bearing and subsequent fertility, *Family Planning Perspectives 10*, 209-218.

TrustLaw (2012). Canada best G20 country to be a woman, India worst, *TrustLaw & Thomson Reuters Foundation Service*. http://www.trust.org/trustlaw/news/poll canada-best-g20-country-to be-a-woman-india-worst/ (accessed 15 September 2012).

UNICEF (2010) Global database on low birthweight incidence 2005-2009. Available at: http://www.childinfo.org/low_birthweight_status_trends.html (accessed 28 February 2011).

UNICEF (2012). *Progress for Children A Report Card on Adolescents*, Available at: http://www.unicef.org/publications/index_62280.html (accessed 18 September 2012).

United Nations Population Fund - India (2011). *Trends in Sex Ratio at Birth and Estimates of Girls Missing at Birth in India (2001-2008)*. New Delhi, India. Available at http://india.unfpa.org/?publications=2440 (accessed 22 October 2012).

United Nations (2011). *World Population Prospects, 2010 Revision*, Department of Economic and Social Affairs, Population Division. Available at http://esa.un.org/unpd/wpp/ (accessed 15 June 2011).

United States Central Intelligence Agency, *CIA World Factbook*, "Korea, South," March 18, 2013. Available at:https://www.cia.gov/library/publications/the world-factbook/geos/ks.html (accessed 24 March 2013).

Urquieta, J., G. Angeles, T. Mroz, H. Lamadrid-Figueroa, and B. Hernandez (2009). Impact of Oportunidades on skilled attendance at delivery in rural areas, *Economic Development and Cultural Change 57*, 539-558.

Verhoeff, F. H., Brabin, B. J., van Buuren, S., Chimsuku, L., Kazembe, P., Wit, J. M. and Broadhead, R. L. (2001) An analysis of intra-uterine growth retardation in rural Malawi. *European Journal of Clinical Nutrition 55*, 682-689.

Visaria L. (2005). Female Deficit in India: Role of Prevention of Sex Selective Abortion Act, paper presented at the CEPED-CICRED-INED Seminar on Female Deficit in Asia: Trends and Perspectives, Singapore, (5-7 December).

Washington, E. L. (2008) Female Socialization: How Daughters Affect Their Legislator Fathers' Voting on Women's Issues, *American Economic Review 98*, 311–332.

World Bank (2007). *Global Monitoring Report 2007*: *Millennium Development Goals - Confronting the Challenges of Gender Equality and Fragile States*. Available at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPOSPECTS/0,,contentMDK:23103267~pagePK:64165401~piPK:6416502~theSitePK:476883,00.html (accessed 1 March 2013).

World Economic Forum (2012). *The global gender gap report 2012*, Available at: http://www3.weforum.org/docs/WEF_GenderGap_Report_2012.pdf (accessed 1 March 2013).

Xing Z. W., L. Li and T. Hesketh (2009). China's excess males, sex selective abortion and one child policy: analysis of data from 2005 national intercensus survey. *BMJ 2009*; 338:b121.

Young, K. (1993) *Planning development with women: making a world of difference*, London: Macmillan.